Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 64 NEW YORK, SATURDAY, AUGUST 22, 1914 No. 8

The Price of Neutrality

In none of his utterances has President Wilson given better evidence of his statesmanship and appreciation of his mission as a real leader than in the appeal for reason in war discussions here. More than any other country in the world, this nation has drawn people from all lands. These people have strong affections and ties which still bind them in sympathy with the nations at war. Only the short time that has passed, scarcely measured by weeks, is necessary to show that efforts will be made from both without and within to drag this country into the conflict. In his solemn word of warning against "that deepest, most subtle, most essential breach of neutrality" which may spring out of "passionately taking sides" Mr. Wilson voices from his high position the sober wish of thinking people that this country may keep out of the war. There is a cost or compensation about all things. Like other things, neutrality has its price. If that price is the closely guarded expression which the President believes is necessary, let us willingly pay the price. Without wavering Mr. Wilson bent all his efforts and influence toward honorable peace in Mexico. We do not need to read his latest words to know that if peace is possible he is for peace. Our opportunity does not lie in war but in a control which will fit us, alone of all the nations of the world, to act for peace when the hour is ripe. Twice have the President's recent statements shown that he is not unmindful of that opportunity by which this country can serve the world and promote its lasting peace.

Money Available for Public Utilities

Bankers generally are of the opinion that the new federal reserve act will have a decidedly favorable influence on the financing of public utilities. Formerly, owing to its antiquated banking laws, this country was in the position of the merchant who carried continually in his cash drawer a great deal more money than he ever used. We have been keeping a much larger reserve of gold than any other civilized nation in proportion to the amount of business being transacted. Credit has been unevenly distributed and could not always be used when and where it was needed. The new banking act will set much of the idle money to work. By making a great reduction in reserve requirements it will release a large volume of funds after the new needs of the federal reserve banks are complied with. The possible danger of inflation at the beginning of this period has been foreseen and will be guarded against. Adjustment to changed conditions will be quick, and then the far-reaching effects of the increase in this country's working capital will be felt. Even if there are no changes in business methods, credit will be cheaper and more evenly diffused. It will be more steady, and those who are entitled to it will find it promptly available. This will come at an especially opportune time for public utilities in all stages of establishment. Its effect should be particularly apparent in the opening up of fields that have remained undeveloped under old conditions. Financing extensions of developed enterprises should proceed on a steadily increasing scale, and after readjustment to changes brought about by the European industrial stagnation, the electrical industry in this country should enter on a new era of progress and prosperity.

Central Stations and the War

So far as war costs are visited on central stations in this country they will come from the condition of general business. Assuming continued neutrality by this nation, it is plain beyond argument that business interests will keep trade active. In this effort they will have the support and co-operation of bankers. As a people we are wasteful and extravagant in buying and consuming and, even with hostilities among European countries, there will still be a wide market here for our own goods. This means activity, although the exact measure of that activity can be gaged more accurately a little later when the situation is steadier than it is under the first shock of war. The consumption of electrical energy will go on. The load for residence lighting represents one of the first household necessities. The load for motor service is affected by the vicissitudes of business. If manufacturing is curtailed, this load, so far as it represents connected service, will be reduced. But there is a fine element of strength in the electrical industry which differentiates it from many other forms of business. Its markets have not yet reached the saturation point. Some years later, when they do, the increases in gross revenue will not be so astonishing. But until they do there are always encouraging openings for new contracts that help to overcome the reduction in demand from existing installations. From the standpoint of gross business central stations can make a showing that will again prove the virility of the electrical industry. Until banking conditions are restored to their normal state operators of central stations will pay heed to the temporary cost of capital. Generally, financing will be postponed until the banking situation is cleared. The banks have complete control and will not relax precautions until they are confident that such action is entirely safe. Local banks in communities of

independent wealth are desirable financing agencies for central stations under the conditions prevailing now, when necessary financing is likely to be temporary. Central stations have ordinarily a rate of growth that can be forecast accurately, and it is therefore usually the case that they are well prepared in advance against disturbance in the money market.

The Fort Worth Generating Station

Despite the leveling effect of standardization in equipment, the large Texan plant described elsewhere in our columns is somewhat notable in a number of features. The steam plant in particular is worthy of comment as it is specialized to meet the conditions of local fuel supply. It is designed to utilize efficiently the rather low-grade Texas and Oklahoma coals and incidentally to work with natural-gas firing. Coal is conveyed by a crane from cars or from storage bins and dumped into the large suspension bunkers, whence it may be shot down to the mechanical stokers. A crusher traveling the whole length of the bunkers on rails can receive coal from the crane bucket and discharge it into the bunkers if the shipments require this treatment. The plant is worked at high steam pressure and superheat as befits the economical use of turbines. One boiler has been fitted with burners for natural gas in addition to its regular setting, and steam can thus be raised in seven minutes if necessity requires.

The water supply involves some unusual features. The feed water comes from wells 1200 ft. in depth, being pumped by the air-lift method. Water for condensation is obtained from the river, when water is available, through the use of a cooling pond. The intake pipe opens into the deepest part of the pond near the dam, while the condenser discharge goes into the stream 200 yd. above, only the cooled portion getting back into the intake, as the upper layers of warm water pass off over the spillway. The river supply is also utilized for an under-water coal-storage pit built of reinforced concrete to hold 6000 tons. When the river runs almost dry reliance is placed on four large cooling towers for the service of which turbine-driven boosting pumps are thrown in to assist the ordinary motor-driven circulating pumps.

Another unusual feature of the plant is the distributing voltage of 4000 for the local service. The neutrals of the star-wound generators are solidly grounded; the transformers are arranged to be put in "star" at 4000 volts or in "mesh" at 2300 volts as occasion requires. Several transformers are arranged to transform from three-phase to two-phase for supplying energy to a large number of two-phase motors which were in use before the older plant was replaced by the present station. Much energy is also delivered at 60,000 volts to the lines of the Texas Power & Light Company. The details of the system seem to have been very thoroughly worked out, and the plant represents a capital example of meeting effectively the requirements of a somewhat unusual situation.

Prosperous Farmers and Electric Service

With assurance of exceptionally heavy crops throughout America and an unprecedented foreign demand for American agricultural products, the farmers of this country are justified in expecting unusual prosperity to be upon them before the year's end. The maximum amount to sell at the maximum price per unit sold is what the immediate future seems to have in store for them. On the basis of prices during peace, it has been estimated that the total value of this year's crop in the United States will be at least $11,000,000,000. Just how high the prices will rise as a result of the European consumption it is difficult to predict, but it is safe to state that the farmers will have considerably more money to spend than usual this fall and winter. Manufacturers of electrical apparatus are aware of this prospect, and some of them are planning to take advantage, if they can, of the opportunity thus presented. This is particularly true of the makers of farm-lighting sets. These outfits usually consist of a gasoline engine, a generator, a storage battery, an automatic voltage regulator, a small switchboard and two or three measuring instruments. A large number of these sets have been sold for the lighting of country homes, and it is believed that with the growing prosperity of the farmer a special effort will be made to interest him in electrical conveniences. It has been said that these isolated plants should not be regarded as competing with the central station where the latter is making an effort to extend its lines into the country to serve farmers. The manufacturers, or at least some of them, contend that they are educating the farmer and the farmer's wife in the use of electrical conveniences, and when the rural user has become accustomed to electricity he will demand such service as can best be supplied by the central station. Whether this theory is correct or fallacious, it is an undoubted fact that there are many places where the farmer would be deprived of the benefits of electricity unless supplied by an isolated plant. In these situations it would seem that no one interested in the electrical industry could oppose the installation of isolated service. Where there is a chance for competition, each case must be decided on its merits.

Formation of Export Associations

The suggestion for the formation of export associations among manufacturers of allied lines, advanced by Mr. M. A. Oudin in the interview published in this issue, is constructive and helpful. Manufacturers who have not enough plant equipment or business to send their own representatives to foreign countries can unite in such associations and meet some of the needs of foreign consumers. If these manufacturers confine their united activities wholly to allied but non-competitive lines, scarcely any question of possible conflict with the law or public policy of this country can be raised. The only ground for interference would arise in case a manufacturer to whom admission was denied should assert that the combination was unlawful; but this is a claim

that seems so remote a possibility that the chance should not deter manufacturers from union in such associations. Though associations conducted carefully on these narrow grounds would not be so effective as the long-standing German associations in which competitors have combined to wrest foreign business from other countries, they would still be efficient and profitable means of opening some export trade to small manufacturers who otherwise would have no chance to reach the overseas markets. Mr. Oudin did not touch in his interview on the larger question of export associations among competitive manufacturers. In the absence of construction by a final court of the attitude of the Sherman law on this point, and in the doubt as to the attitude of the public in regard to associations of competitors designed to deal wholly with even export business, associations of this kind have not given the aid to our manufacturers that they have given to foreign competitive manufacturers. It is reasonable for American manufacturers to ask Congress now to make it legal to form associations of competitors dealing with export business. Congress can do this without relaxing in any measure its inhibition against combinations affecting domestic business. The argument for associations to foster export trade by the use of even the expedient of combination is that thereby the production of American factories is increased, the capital investment receiving greater stability of principal and return and labor more regular employment. Mr. Oudin's suggestion is excellent, but it cannot do so much good to American industry as combinations similar to the unions of foreign manufacturers which our industries have had to face when they have gone into the world markets in past years.

The Battle of Giants

This is neither the time nor the place to analyze the approximate causes of the present European war. Future historians may secure from the confessions of the dying or the secret memoranda of the dead the inmost story of its inception, but in the last resort it is a demoniac struggle for the abrogation of the Eighth Commandment. Could some benign Omnipotence rule that no boundaries should be changed and no war indemnities be collected, every cannon would soon be silent and every sword sheathed. It is not a war of race hatred or revenge or mad ambition, but of envy and covetousness and plunder. Worst of all, it is the titanic embattlement of bloodthirsty and cynical militarism against all the righteous impulses of a Christian civilization. With whomsoever one's sympathies may lie, he must recognize that at the end irreparable evil will have been wrought unless the world shall have been taught thereby to lay down its arms and dwell in peace.

We are far from being advocates of peace at any price, of supinely yielding to oppression and surrendering the rights of future generations unresisting. Wars always have been, and perhaps always will be, until human nature is void of evil, but such a horrible mêlée of nations as is this ought to be without the range of possibility. Thus to remake the map of Europe is not worth the price from any point of view. Provinces may be made fertile with blood but the tillers will be few; the grass may grow rank in city streets and there will be none to mow. The slaughter has just begun and thousands of brave and useful men have already laid down their lives, to be followed by tens of thousands more, while hundreds of thousands, perhaps, will return maimed and broken to drag out the remnant of their shattered existence.

Scarcely less dreadful to contemplate is the utter wreckage of civilization and the arts of peace. To remove from useful efforts a large share of the world's workers for months or years paralyzes every industry and blocks the wheels of progress. Were the war to stop to-morrow it would be many months before the orderly procedure of affairs could be resumed. Let it go on, as now seems likely, for a prolonged horror of desperate fighting, and it will be more than a generation ere men's lives are settled anew and war's work fairly put aside. Every participating nation will stagger under the weight of public and private debt, and every industry will have to struggle upward from devastation. This much one can predict with certainty. Of the destruction which will intervene one cannot even guess. It may be that the issue may fairly be decided at the point of the bayonet, or, just as "General Winter" checked the imperial career of the great Napoleon a century since, so now the gaunt legions of Field Marshal Famine may turn the tide of battle and scatter the warring millions.

From its situation and its traditions long honored, our own country is clear of the fray in any probable course of its development, but our duties are none the less imperative—to preserve even-handed neutrality toward the combatants, with all of whom we are on friendly terms; to lend a hand to every effort to promote an honorable peace, and to give such aid as we may to the suffering. In no way perhaps can we do more for ultimate peace than by refusing financial support in continuing the war, as has already been done in at least one instance. What resources we have will be needed to the last dollar in the slow and weary work of rehabilitation after peace comes. And meanwhile we can help the neutral nations to lessen the incidental burdens that war brings upon them. We ourselves must suffer from the struggle in many ways and bear the harm as best we may. Many a factory will be shut down and many a prosperous business wrecked. Yet, on the whole, with the world's trade open to us, the outlook is not so bad as it seemed for the moment. Confidence is being restored and business is beginning to readjust itself to the new and strange conditions. We cannot keep away from our hearts the horror of the thing, but we can at least bear home to all who struggle, Briton and Gaul, Teuton and Slav, the evidence of honorable friendship and the earnest desire to bring about enduring peace—a peace perchance where The Hague will be the court of last resort and its decrees will be enforcible.

Effect of War on the Industry

Consumers in South America Need American Goods—Export Markets for Electrical Manufacturers

Secretary Lane on the Value of Our Resources

Mr. Franklin K. Lane, Secretary of the Interior, stated in an interview that a direct benefit to the United States from the European war will be its effect in making the people of this country realize to a greater extent the value of its mineral resources. He declared that the interference with manufacturing caused by interruption of the flow of importations of many necessary raw materials may be overcome almost wholly by development of neglected resources in our country. The main difficulties to be overcome in order that the United States may make itself independent of the rest of the world in its manufactures are in the rearrangement of the distribution system necessary to the establishment of this independence.

It has been easier and perhaps cheaper, Mr. Lane added, to import mineral products and materials from other countries than to go to the trouble and expense of developing our own resources of the same nature. Mr. Lane added that the suspension of ocean transportation will not mean disaster to our industries but inevitable interruption to some extent. It means that some of the materials upon which great industries depend must be obtained from other sources. Importers, consumers and manufacturers are making anxious inquiries as to where they may find in the United States supplies of crude materials to replace the foreign supplies now shut off. This is the opportunity of the United States to free itself from dependence of its industries upon other countries. Business men are awakening to this fact.

Argentine Welcomes American Manufacturers

In an interview Señor Romulo S. Naon, Argentine Ambassador to the United States and one of the A-B-C mediators in the Mexican trouble, expressed the hope that American manufacturers would respond promptly to the commercial needs of his country. As evidence of her desire to trade with us he cited the emergency foreign exchange system which his government had established. He warned American manufacturers, however, that South American trade customs must be studied if headway is to be made.

It is necessary, he said, for the American manufacturer to change his business methods from what are customary here when trading with a South American country. Payments at 90 or 120 days are considered as cash payments. It is almost useless to expect any inquiries from pamphlets delivered by mail. Traveling salesmen, equipped with letters of introduction and other credentials and familiar with the South American ways and manners, are necessary if goods are to be sold.

Engineers and engineering contractors should also realize that bids are generally delivered in person by a representative, and not by mail as is customary in the United States. In advertising for bids on construction work the interval of time given before opening proposals is often as long as six months, so as to enable representatives of foreign firms to forward specifications and other data to the home office and allow adequate time for the preparation of careful estimates.

Extensive commercial relations depend on good banking facilities, a fact that has been readily appreciated by the Argentine Senate and Chamber of Deputies. On Aug. 11 a law was passed empowering the executive to receive and deposit in the Argentine legations sealed gold from commercial and banking houses. The Treasury Department upon receipt of telegraphic advice from the legation will then issue a bond in favor of the Caja de Conversion for the amount of gold deposited. Against the delivery of this bond through the Banco de la Nacion Argentina, the Caja de Conversion will deliver to the same bank the equivalent in paper pesos, to be credited to the proper person.

The Argentine government, Señor Naon said, has thus made foreign exchange easy. It is for Americans to supply the ships. They can enter the South American trade in force assured that they will be received most cordially by the nation to the south.

Trade Information for Manufacturers

The foreign trade department of the National Association of Manufacturers has issued from its office in New York City under the date of Aug. 19, 1914, No. 1 of a series of special foreign trade bulletins. The special bulletins are intended to keep members advised promptly of all developments affecting the export and import trade arising out of the war. Further issues will be made as occasion warrants. The bulletin discusses the effect of the war on American trade, the conditions governing banking, credit and exchange and present shipping conditions. The data in regard to shipping conditions were compiled by the managers of the international freight bureau of the National Association of Manufacturers and are illuminating as to the interruption of service and heavy increases in rates. Marine insurance rates are also quoted in the bulletin. These, of course, are still large, although the bulletin states that the outlook is for a decrease rather than an increase. The subjects of other articles in the bulletin are as follows: "Contraband and Neutral Trade," "Loss of Goods in Transit," "Moratorium Defined," "Foreign Collections" and "Proposed New Shipping Laws."

Partly Filled Foreign Order Opened to Americans

The interruption of manufacturing in Germany and of shipments from that country has led the Chile Copper Company to come to this country for some of its electrical equipment. This company is controlled by the Guggenheim interests, and it is building a power plant with a transmission line 85 miles in length in connection with the development of copper deposits in northern Chile. American electrical manufacturers were asked to bid on the complete construction and equipment of the plant originally. The station contract,

however, was let to the Siemens & Schuckertwerke Company, which undertook to erect the plant complete for operation. The plant is partly finished but lacks some equipment. It is designed to hold four 10,000-kva units, and two of these are delivered. As one of the four units is designed for reserve purposes, the installations of three would provide for the full capacity of the plant. It is expected that the plant will be started on March 1 with the one-half of the units already in place.

When it was seen that on account of the war further manufacture and shipments would be discontinued in Germany the company began to ask for bids through its New York office from domestic manufacturers for that part of the material which had not been delivered. It is estimated that the total value of this part of the material is in the neighborhood of $100,000. Most of the orders for the electrical material needed have been placed, and the company expects to be able to start the plant on schedule time.

Mr. Oudin on the Export Needs Created by the War

Mr. M. A. Oudin, manager of the foreign department of the General Electric Company and a member of the National Foreign Trade Conference, in an interview with a representative of the *Electrical World*, declared that the opportunity before American manufacturers as a result of the curtailment of European production is one that concerns all industries. He was glad to give his ideas because he regards it as a patriotic duty to do all that can be done to remove the obstacles which have hampered the growth of export business. The problem is larger than the interest of a single company or a single industry.

In emphasizing the fact that the probable effect of the European war upon American exports is a subject of the utmost permanent importance, Mr. Oudin said that it is engaging the attention of the general public, as well as of those immediately concerned with export trade. There has been a complete paralysis of the machinery for manufacturing, purchasing and selling abroad the output of factories, mines and fields of most of the continental countries of Europe, and at the same time a partial stoppage of the export trade to Great Britain. Nations that are not at war which have been supplied hitherto by the European countries immediately affected by the present hostilities must fill their requirements in some other manner. In these circumstances the great neutral manufacturing and producing country best able to meet the demand is the United States.

The electrical business should share in the stimulation which our exports are bound to experience in the immediate future. The question which most concerns electrical manufacturers is how this trade may be acquired on a profitable and permanent basis.

Adverse Factors

Mr. Oudin pointed out that while the stoppage of European supplies of all kinds is a factor favorable to a great extension of American trade, there are two adverse factors which have a very important bearing upon the magnitude of the trade that may be obtained. The first adverse factor is the financial disturbance which has existed throughout the world for over a year; this economic depression, particularly in South America, has been made much worse by the war in Europe. The second adverse factor, which is of a temporary character, is the dislocation of transportation facilities which now exists.

The two most important markets for our goods in South America—namely, Brazil and the Argentine—have been passing through a financial crisis of the first order. The inability on the part of the former country to obtain the loan which was needed so greatly has accentuated an already difficult situation. This loan was almost closed when the war broke out. The withholding of European funds for the further development of public and private enterprises in both countries will cause a cessation of engineering and other work there.

It should also be remembered, Mr. Oudin added, that the purchasing power of South American countries particularly has been greatly lessened by the partial closing of the European markets to their products. This undoubted lessening of exports from South America, with the result mentioned, will be offset more or less by an increase in prices.

For the reasons given above, at least reasonable caution should be exercised in the extension of credits. However, this is a time when liberality, both at home and abroad, should be shown by bankers, manufacturers, merchants and others, and, so far as possible, a give-and-take policy should be followed in order that a possibly unhappy economic condition may be averted.

Interruption of the shipping facilities in this country would have a most serious effect upon home affairs if prolonged, and a continuation of this situation would go a long way toward nullifying the favorable opportunities for furthering our export trade. But already the situation is much improved. Mr. Oudin expressed pleasure that so far as it has the power Congress has relieved this situation by passing a law admitting under certain conditions foreign vessels to American registry and removing the regulations heretofore applying to our merchant marine which made the employment of ships in our foreign trade an unprofitable adventure.

War Risks for Shipping

It should be noted, however, that so long as the war lasts the change of vessels from foreign to American registration is not necessarily going to improve the position materially, for, notwithstanding the fact that an increasing number of vessels become available as time passes, the expense of transportation at the present time has blockaded our ports with goods. Freight rates have been increased from 25 per cent to 100 per cent and war risks on neutral and American bottoms are not low. The British and French governments, in order to encourage the movement of grain and other products, are prepared to guarantee war risks on vessels flying their flags, and also have announced their intention of insuring cargoes against the vicissitudes of war at a reasonable rate. That announced by the British government is approximately 4 per cent. It is not likely, Mr. Oudin thinks, that insurance brokers will give lower war risk rates on American ships. Strange as it may seem, since neutral and American boats run the risk of being blown up by mines or of being seized as prizes because of contraband of war which they may be carrying, they must be insured. Congress has been urged by the National Foreign Trade Council to undertake to guarantee war risks on both vessels and cargoes. If this is not done in manner similar to the new departure of the British and French exporters, American exporters may find practically no advantage in shipping by American vessels.

The question which naturally arises, said Mr. Oudin, is: How can the manufacturers in this country take advantage of the present situation abroad? It is a well-known fact that a very large percentage of our exports of machinery and of manufactures of a complicated character, involving a high percentage of labor, are done by companies of large resources and capital. This is the strength and the weakness of our export situation. It is the strength because it means the prosecution of a

foreign trade movement on a large scale, with a disregard of early discouragements and a bending of every effort toward the development of a business for later years, even at some initial cost; it is the weakness because up to this time the population of the country as a whole has not been sufficiently interested in the wonderful possibilities of this trade to try to promote it. The large manufacturers have been the pioneers and they have already blazed the way along which the small manufacturer can follow. The small manufacturer, however, does not seem to have taken full advantage of the opportunities—not that he has been discouraged by the difficulties of obtaining a foothold in the foreign market, but perhaps because he has not realized the necessity of foreign markets for his output. With the prestige already made in many countries for American goods and with the reputation for honest dealing established in these countries by large American concerns, the path has been made easy for the introduction of the goods of the small manufacturer.

Representation, Price and Quality

The essential elements in the exploitation of manufactures abroad, Mr. Oudin declared, are representation, price and quality. If the small manufacturer cannot afford to have his own office abroad he must have recourse either to agents as a medium through which his goods may be sold or to commission houses or brokers in his own country. Another method by which the small manufacturer can acquire a market is through association with other manufacturers of allied lines. The idea of export associations is a new one in this country and has not yet been adopted to any material degree. There is no secret as to the ways and means of securing foreign business. The methods of our great competitors, the Germans and English, are apparent to any one who is familiar with foreign trade conditions. What America is especially weak in abroad is personal representation. The splendid machinery used by England in her foreign trade has been built up during a century. The number of English firms established throughout the world dealing exclusively in English goods is almost legion. In the last thirty years Germany has copied English methods and German firms are being established in constantly increasing numbers in every country on the globe. What we need most abroad is American business houses. Until our small manufacturer can sell his goods through such concerns established abroad his business is bound to be more or less intermittent, for it is obvious that he cannot depend upon the permanency of an agency arrangement with a European firm, nor can he secure the highest effectiveness from an arrangement with a native concern. As to prices, the prices of American manufacturers are higher ordinarily than those of European competitors. This is due to the higher cost of labor which prevails in this country. The influence of the war will operate in the direction of overcoming that handicap because it will have a tendency to increase labor costs in Europe. As to quality, American goods in general are superior to those of European countries, especially of Germany, but they are not always sufficiently superior to overcome the differences in cost. In many lines American engineering is recognized as superior to European engineering, but this advantage is not regarded as sufficiently great in some countries to overcome differences in cost. Particularly is this true in countries whose financial resources are limited and where the people are more concerned to get low first cost than about the future maintenance and operating expenses.

In the beginning American manufacturers should make up their minds to spend a large amount in investigation of foreign conditions, particularly in South America. They should expect no return for the first year or two. The difficulties of the language, the different customs and different business practices, and the entire difference in racial characteristics, are not perhaps fully appreciated by those who do a little export business with Latin America, and not at all by those who have no acquaintance with the Latin-American people. It is worse than useless to send the American type of drummer to South America.

Already two factors have been mentioned prominently as bound to influence our foreign trade favorably. One is the increase in our merchant marine and the other the establishment of American banks abroad. Mr. Oudin believes that it is easy to overestimate the influence of these activities in creating new business. In normal times foreign ships carry American goods as cheaply and as expeditiously as American vessels possibly can. He does not wish to be understood as in any way deprecating the necessity of having a merchant marine. The shipping business is one which can be conducted with profit, and had we our own ships the vast sums now paid to foreign shippers would be kept in the United States; but the *per se* increase in our merchant marine will not greatly influence our foreign business.

Influence of Banks on Commerce

The establishment of foreign banks abroad will have certain advantages which must affect our foreign trade favorably, but is not likely to have as great an influence upon it as the other factors which have been mentioned. Americans established in business abroad utilize foreign banks at the present time for the following purposes, viz., for purchasing exchange, for ordinary banking purposes—i.e., as depositories—and for obtaining information with reference to credit of prospective purchasers. It is not conceivable that American banks will quote lower rates of exchange than existing foreign banks. It is possible that American banks may offer improved banking facilities and establish reciprocal credit between two trading countries. It is generally necessary for American business houses established abroad to do business with a bank which has branches throughout that country. If American banks established abroad could have branches in different parts of the country, there is no doubt that such banks would assist to a very large extent in securing more reliable information as to the financial standing of prospective purchasers.

The great potential influence cited by Mr. Oudin in connection with our foreign business in the establishment of banks in foreign countries is that thereby American capital will be encouraged to seek investment abroad. This possibility opens up a field of conjecture which is highly interesting. The absorption of capital by Europe for its own needs has left most of the other countries of the globe without the funds necessary to carry out great improvements already under way and in contemplation. Perhaps as much as one-half of the exports of Germany and England are the result of the participation of German and English capital in foreign enterprises and are a direct result of the sympathetic interest of European bankers in the financial debts of other countries. If American banks abroad could arouse American investors to the opportunities for investment in these foreign countries, both in issues of government bonds and the loans of private enterprises, their usefulness would be established beyond any question.

Mr. Oudin's familiarity with conditions convinces him that the present concentrated attention upon our foreign business is a potential factor making for a very large foreign trade, and that it must give rise to the permanency which has been conspicuously absent in the past.

Acting Secretary of the Department of Commerce on Export Opportunities

The following statement has been made to the *Electrical World* by the Acting Secretary of the Department of Commerce:

South America is a growing market for electrical machinery and supplies, and one in which the United States should have a greater share of business. That this country will be called upon to furnish the South American countries with more electrical materials will be the natural result of the war now in progress in Europe; but the permanence of this business depends upon a change in certain factors that have worked much to the disadvantage of American manufacturers and exporters. Heretofore the countries of South America have looked to Europe for capital to develop their natural resources and to utilize their water-power in the development of electrical energy. This source of capital is now largely or completely cut off, and the result will be a curtailment of expenditures and the postponement of new enterprises until more auspicious times. The United States will profit, no doubt, through the necessity of getting supplies, but it should be borne in mind that purchases by South American countries will be limited to urgent needs.

Nationality of Engineers

The chief factor against the sale of American equipment and supplies is the fact that the source of capital for South American enterprises and the nationality of the engineers have largely determined where they shall be purchased. A project with German financial backing, carried out under the supervision of German engineers, is practically certain to use German materials, so far as they are available at competitive prices. In fact, in recent years it has become a practice for banks furnishing the money for such enterprises to stipulate the use of materials from the country in which the banks are situated.

Investment of United States capital in South America is small as compared with the amounts invested there by England, Germany and France. Hence supplies of electrical machinery and supplies in this country have been at a great disadvantage. Conditions in the electrical field are similar to those obtaining in the railway field. A consular report from Brazil makes this significant statement:

Investments of Europeans

"Unfortunately, there is very little American capital invested in railways or other public utilities in Brazil, and while steam and electric roads are managed by Americans who favor American equipment, these managers cannot, in justice to their stockholders, place orders elsewhere than in Europe, everything else being equal."

From Chile comes the statement that "practically all the electric-light companies of this district are German, and they favor German supplies whenever possible."

The one country that seems to have been most successful in combining the efforts of bankers and manufacturers toward the increase of business and export trade is Germany. Back of the greatest electrical concern in Germany is a group of banks that furthers the interests of the combine in foreign countries by furnishing money for the development of various enterprises. The net result is that the money furnished by these banks is spent largely in the purchase of goods from the manufacturing companies with which they are allied.

Trade follows investment, and when the United States enters the foreign field of investment it will reap the benefits not only in interest upon the actual money furnished but also in increased sales of American goods.

It must be borne in mind that the financial resources of the great European nations are being rapidly exhausted by war. It is fair to assume that it will be many years before they recover from its effects. In the meantime they will have great industrial problems to solve at home and investments in far-off South America will be much less attractive to their citizens than they have been in the past.

Opportunities Before American Manufacturers

The time seems ripe, therefore, first, for a more liberal investment of the United States in South American development; second, for a very considerable business in ordinary electrical supplies and in the equipment necessary for the completion of projects already begun; third, for demonstrating to the people of South America the satisfactory character of American electrical apparatus. In common with other American-made goods, apparatus of this kind has been misrepresented by foreign competitors, and we ought to make the most of our opportunity to demonstrate its excellence. To take the fullest advantage of the present situation prompt and vigorous action on the part of our manufacturers is needed.

Mr. Hurley on Electrical Exports to South America

Mr. E. N. Hurley, president of the Hurley Machine Company, of Chicago, and also interested in a number of other business enterprises, is an enthusiastic student of the foreign-trade possibilities of the United States in South American countries. He has been engaged in the export trade since 1899 and is chairman of the foreign trade committee of the Illinois Manufacturers' Association. He was chairman of a large delegation of business men sent by that association to South America in February of this year. This party was gone three months. Mr. Hurley was also requested by Secretary Redfield of the Department of Commerce to investigate banking and credits in South America. He has just made his report on the subject to the department.

Mr. Hurley is very strongly of the opinion that there are great possibilities in South America for electrical manufacturers of the United States. To a representative of the *Electrical World* Mr. Hurley spoke of the extensive use of electrically developed water-powers in Brazil. The particular development referred to has been brought about by the investment of Canadian and American capital, and American electrical equipment is used. The principal electrical needs of Rio de Janeiro are supplied by one central-station company in charge of an American.

If four competitors were struggling to get a certain class of business and three of them were compelled to cease their efforts, would not the situation redound, Mr. Hurley asks, to the advantage of the fourth man still doing business? The situation is not quite so simple as that, for means must be provided for transporting goods, and it is also to be remembered that the South Americans must be able to sell their products in order to buy our manufactured goods. However, steps are being taken to provide facilities in both of these directions, and if American manufacturers are alert and enterprising at this juncture, they will be enabled to take advantage of a great opportunity for extending their business.

War Risk Insurance and Foreign Exchange

Mr. Hurley was present at a conference called by the Secretary of the Treasury and held in Washington on

Aug. 14. Representative bankers, business men, shippers and insurance people discussed the South American trade situation. After the passage of the Alexander ship-registry bill, the matter of war-risk insurance will be taken up. It is said that there are over 100 ships owned, or principally owned, in this country but flying the British flag. They will raise the American flag if the ship-registry bill becomes a law, but then some means must be provided for the war risk. Possibly the government may appropriate the sum of $50,000,000 to be an insurance fund back of the war-risk protection guaranteed by the United States, the shippers or owners paying 5 per cent premiums for the protection. This would be in addition to the ordinary marine insurance. Of course, it is not expected that ships flying the American flag will be attacked by belligerents; nevertheless, the dangers of navigation are very greatly increased by wartime conditions, owing to the possibility of mistaken identity, the placing of mines, darkened lighthouses and other military expedients.

Means are being provided now to establish foreign exchange between South American countries—particularly Argentina, Brazil and Chile—and the United States. It is probable that New York bankers will establish a fund which will be sufficient to provide exchange not otherwise available owing to the unsettled condition of financial affairs in London. It is to be remarked that the action of the United States government in inviting the mediation of Argentina, Brazil and Chile in the Mexican situation has had a good effect in South America. It has helped to dissipate the idea of many persons there that the attitude of Americans toward the inhabitants of the Latin-American republics is one of patronizing superiority.

As a student of foreign trade Mr. Hurley was asked for some advice to American electrical manufacturers. He gave these hints:

Advice to Those Seeking Foreign Trade

First—All kinds of electrical products are and will be in demand in South America. The American manufacturer does not have to change his product to meet any unusual conditions in the Latin-American countries. It has been said that Americans do not adapt themselves to the demands of the South American trade. If this is so, it has nothing to do with electrical products. It is not necessary to change patterns to produce appliances that will be useful in South America.

Second—Electrical manufacturers should get the addresses of people engaged in the electrical business in South American centers.

Third—Letters should be written to these persons in the language of their country—Portuguese for Brazil, Spanish for all the other South American countries. The attitude of American business men should be that of extending a helping hand to their fellow business men in these foreign countries. Printed matter in the language of the country should follow the letters. It is a mistake to try to sell all kinds of goods at once. It is well to push specialties and novelties at first. The Illinois Manufacturers' Association will probably advertise in four of the principal South American newspapers, offering the assistance and co-operation of the association in any way to local merchants. This example might be followed by electrical manufacturers. It is well to avoid being in too much of a hurry at the start. It must be remembered that exchanging goods with South America must be regarded as a give-and-take proposition between equals.

Fourth—Do business in South America something after the manner in which a Boston house would go after business in Oklahoma. That is, in a friendly, sensible way, adapting yourself to the character of your customers.

Fifth—The direct salesman must speak the language of the country. He may well follow the printed matter after a little business has been worked up. However, it is to be remembered that the larger aspects of the South American trade campaign should be handled by executives who may go to the countries in question and direct the efforts of salesmen. It is not so essential that these broad-minded executives should speak the language of the country. As foreign trade develops it must be studied in a broad-minded way. The American who can study foreign markets on the ground, who can plan campaigns, who can feel at ease with the highest authorities, and who can direct the efforts of perhaps twenty or thirty salesmen, is of very great value in the foreign commercial work in which the United States must now engage. It is men of this class to whom Mr. Hurley refers as "executives."

In conclusion, the Chicago expert said that he would like to emphasize the point that the foreign consuls of the United States are all right. They are almost always men of education and experience and they are eager to extend a helping hand to the interests of business men at home. With their card-index systems and their modern methods of keeping track of the business of their offices the consuls are a very great help. Further, American machinery has a good reputation for reliability and finish, and the citizens of the United States need not be ashamed of it.

Mr. Tripp Home from Europe

Mr. Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, returned from Europe on the steamship *Celtic* on Aug. 15. As Mr. Tripp could not get accommodation in the first cabin for all the members of his party, they returned by second cabin. Except for the inconveniences due to the fact that the crowding of the second cabin accommodations made it necessary to divide the passengers into three shifts for meals, Mr. Tripp did not mind his experience. Few lights were used at night during the voyage and the portholes were covered with blankets. Mr. Tripp expressed his great pleasure at being on American soil again.

When war was declared by Germany on France Mr. Tripp was in Paris. When he went to the office of his hotel on the morning of Aug. 2 he found that foreigners had been given twelve hours to leave Paris. The force of employees had already disappeared and he could not get even a cup of coffee. After a great effort and necessarily abandoning all baggage he, with Mrs. Tripp and their three daughters, managed to get aboard the train for Calais. Upon reaching London Mr. Tripp met a cordial reception. He said that no American who had seen the sights that confronted the people everywhere in Europe could fail to come back to this country a better citizen than before, and with a keener realization of the high rank to which this nation is entitled because it is controlled by intelligence and reason.

Although Mr. Tripp's voyage was taken for business and pleasure combined, it was interrupted in France, and for that reason he did not have much oportunity of observing commercial conditions abroad. He thinks that it is impossible to form any conclusive opinion at this time as to the effect of the war on ultimate commercial conditions in Europe. Both the French and the Austrian subsidiary Westinghouse factories have been closed. It was necessary to do this because the operatives left to go to war. The plant in Italy is still in operation. The plant at Manchester, England, is

operating on full time. Up to the time that Mr. Tripp left England comparatively few men at the Manchester plant had left to go to war.

The export business of the Westinghouse company to South America, Japan and China is handled from this country, and Mr. Tripp mentioned the opportunity presented to American manufacturers to meet the needs of consumers in those countries. In order that trading relations may be developed the principal necessity is to establish banking facilities and, following the practice of German manufacturers, to give buyers longer time for payment. The German manufacturers have been borrowers at low rates and were satisfied with small margins of profit. There is no reason, Mr. Tripp believes, why this country should not follow the practices to which South American buyers have been accustomed.

Mr. Tripp believes that as a result of the present situation this country should become a creditor nation instead of remaining a debtor nation. By the development of a larger export business it can get a steadier load for factories and reduce the overhead cost. The great bugbear which confronts manufacturers in this country is the fluctuation in the volume of business. When the business is stretched over a larger area the fluctuation in volume is likely to be less.

Advice Regarding South American Markets

Dr. E. L. Corthell, consulting engineer, New York, has expressed his views in regard to the openings in South American markets. Dr. Corthell was engineering adviser to the Argentine government for two years, passing upon all large public improvements. The extensive port works of both Buenos Aires and Rosario were designed and executed under his direction. After the completion of his engagement in 1903 he became interested in several large South American engineering projects. The most recent and one of the largest of these was the financing, design and construction of the port works of Para, Brazil. His past and present connection with officials in South America and financiers interested in South American works qualifies him to speak authoritatively.

Dr. Corthell is urging upon all with whom he comes in contact the importance of seizing without the delay of a day these suddenly arisen opportunities.

The real straits in which Latin America finds itself at the present time are not well known, or at least not appreciated. It is suddenly and almost wholly deprived of the products of vital necessity to its existence, but it has no ships to go for them even if they could reach their most important supply depots, especially in Germany. The United States has no ships in which to send the goods required.

Argentina and Brazil have no vessels suitable for the long course to our ports. Like ourselves, they have a coastwise fleet. In the meantime there is an insistent inquiry from one at least of these governments for ships to be bought instantly. In fact, a cablegram from Rio de Janeiro states that the Brazilian financial minister has arranged to despatch four or five steamers of the Lloyd Brasilero government line to New York with coffee from Santos and Rio and rubber from Para, thereafter to return with articles of prime necessity. Cable messages are now being received from various South American and West Indian countries demanding importunately that we send them what they need.

Our trade with these countries, outside of importations of kerosene and gasoline, harvesting machinery and a few other specialties, is a very small proportion of their commerce with countries now at war, says Dr. Corthell. Note the following important features of the trade of Buenos Aires alone for 1913: Imports from Germany, $69,000,000; Belgium, $21,000,000; France, $37,000,000; Great Britain, $126,000,000; Austria, $6,000,000; United States, $60,000,000. Exports to Germany, $56,000,000; Belgium, $32,000,000; France, $36,000,000; Great Britain, $116,000,000; Austria, $3,000,000; United States, $22,000,000. The total imports were $406,000,000, total exports, $466,000,000, of which trade the United States had not over 10 per cent.

It would seem to be easy to secure now and hold at least 50 per cent of the trade, and the same may be said regarding the whole of Latin America, but it will be no easy task. The Germans, French, English, Italians, Spaniards and Belgians have built up their enormous trade by continued and intelligent effort. They have able agents, their own men, conform to natural and local requirements of the trade, give credit where our manufacturers demand spot cash, have banks to handle the financial business, where we have none, and provide their own splendid steamers with excellent service while even our 10 per cent share of the business is carried in foreign bottoms.

There is only one organization, in New York at least, that realizes the situation, or at least is materially helping Latin America, and that is the Pan-American Chamber of Commerce of New York, of which Dr. Corthell is a founder and an adviser. It has existed only four years, but its altruistic work for the good of all Latin America is telling for the benefit not only of that region but for that of our own country by opening markets and engineering and contracting opportunities for our people.

United States Versus Great Britain in Electrical Export Trade

As was shown in our issue of last week, the electrical export trade of the United States from July 1, 1912, to June 30, 1913, was a little over $26,000,000. For the same period Great Britain exported electrical goods to the value of over $34,000,000, or 30 per cent more than the United States. These figures include all electrical machinery, appliances and apparatus.

The American electrical exports to England have been more than the English exports to the United States to the extent of about $300,000 a year. This means that England took roughly 30 per cent more electrical goods from the United States then we did from Great Britain. This difference is practically accounted for in the export trade of motors and generators.

Great Britain's motor and generator exports into Germany were alone greater then the total American electrical export trade to Germany. Germany annually took from Great Britain electrical goods valued at over $570,000 while she took from the United States electrical goods to the value of only $215,000, or less then half what she bought from Great Britain.

The trade of both nations in Austria-Hungary has been small, and while America led by about 35 per cent, the actual difference has been in the neighborhood of $6,000. England has had none of the electrical machinery trade with Austria-Hungary, and America has had only slightly over $5,000. France bought over 150 per cent more electrical products from Great Britain than from America. The actual difference has been roughly $630,000. The great difference has been in the machinery trade, in which England led by over $600,000, or the difference in the total trade of the two countries. The telegraph and telephone apparatus and

miscellaneous trade was approximately the same, with England slightly in the lead. Russia has been taking approximately half a million dollars' worth of electrical goods annually from Great Britain and only about one-ninth as much from the United States. In the matter of machinery alone Russia took over twenty-five times as much from Great Britain as from America. America's electrical lamp trade with Russia was woefully weak, being less than $500, whereas Great Britain sent to Russia lamps to the value of almost $100,000.

TABLE I—VALUE OF BRITISH ELECTRICAL EXPORTS DURING 1912 TO COUNTRIES NOT NOW AT WAR

Country	Motors and Generators	Lamps	Miscellaneous
Denmark	$64,827	.....	$256,000
Italy	232,002	.....	140,189
Netherlands	48,378	.....	151,387
Norway	128,931	.....	.....
Portugal	37,035	.....	.....
Spain	291,104	.....	214,000
Sweden	.....	.....	8,018
Turkey	.....	.....	218,873
Mexico	48,412	.....	.....
United States	185,206	$3,562	985,021
Argentina	1,028,763	95,001	1,746,200
Brazil	489,885	23,378	1,223,420
Chile	264,425	13,032	253,012
China	138,604	.....	348,104
Dutch East Indies	.....	.....	72,400
Japan	906,658	2,320	570,000
Siam	.....	.....	18,569
Portuguese Africa	256,132	.....	45,356
Egypt	73,496	.....	302,734
Other neutral countries	454,326	121,287	1,608,147

NOTE.—Other neutral countries include Greece, Switzerland, Costa Rica Guatemala, Honduras, Nicaragua, Panama, Salvador, Cuba, Dutch West Indies, Hayti, Santo Domingo, Bolivia, Colombia, Ecuador, Dutch Guiana, Paraguay, Peru, Uruguay, Venezuela, Korea, Philippines and Liberia. Danish West Indies included under head of Denmark. Japanese China included under head of Japan.

The United States and Great Britain did practically the same volume of business with Belgium in all electrical goods with the exception of machinery. In this one item America was credited with about $3,500 and England with over $185,000. The percentage difference, as can be seen, is enormous.

In making up our totals for the exports of the United States and of Great Britain to those countries at war it was found that, excluding England's import trade, America annually sent over goods to the value of $830,000, and Great Britain sent to the Continent $2,400,000. Thus the actual difference is $1,570,000.

England annually sent out to her colonies close on to $20,000,000 in electrical goods. America sent to the English colonies somewhat more than $11,000,000.

TABLE II—VALUE OF BRITISH ELECTRICAL EXPORTS DURING 1912 TO COLONIES OF COUNTRIES NOW AT WAR

Country	Motors and Generators	Lamps	Miscellaneous
Canada	$731,757	$39,188	$919,874
Australia and Tasmania	633,847	202,001	2,826,341
Other British possessions	2,900,000	397,921	10,885,000

America's large trade, of course, is with Canada, with which we have been doing a yearly business of approximately $9,000,000. England, on the other hand, has been sending only approximately $1,700,000 in electrical exports to Canada. Even in Australia and Tasmania our exports amounted to over $1,000,000, whereas England's amounted to less than $5,000,000.

Referring now to Central and South America, the only countries for which the figures are available for both the American and the English electrical export trade are Mexico, Argentina, Brazil and Chile. Britain's trade with Mexico in comparison with our trade was negligible. England's total exports in electrical goods to Mexico were covered by the item machinery and amounted to less than $50,000. The United States, on the other hand, sent electrical goods to Mexico to the value of $2,000,000.

Argentina, however, has been importing about five times as much from England as from America. The totals from England are roughly $3,000,000 and from America roughly $600,000. In the machinery trade America has been doing only one-tenth as much as Great Britain, and in the telegraph and telephone apparatus and miscellaneous trade only one-fifth.

With Brazil America has had the lead again. England sent to Brazil electrical exports to the value of $1,750,000, and America sent $3,000,000. England led in the machinery trade by over $100,000, but in the telegraph and telephone apparatus and miscellaneous trade America did approximately twice as much as Great Britain.

The two countries have been doing practically the same volume of business in Chile. The differenee might easily be bridged by a couple of large orders.

TABLE III—VALUE OF BRITISH ELECRICAL EXPORTS DURING 1912 WITH COUNTRIES NOW AT WAR

Country	Motors and Generators	Lamps, Including Incandescent and Arc and Accessories	Miscellaneous
Germany	$238,473	$35,675	$286,201
Austria-Hungary	.....	.....	17,495
Servia	.....	.....	.....
France	706,218	11,249	299,546
Russia	293,244	95,243	77,894
Belgium	185,746	10,287	149,562

NOTE.—Fans included under Miscellaneous.

England's export trade to Chile was $530,000, and America's export trade to Chile $420,000. Here, as in the other two South American republics above cited, the principal difference is in the machine trade. England has led in selling motors and generators to South America.

California Contractors' Convention

The California Association of Electrical Contractors and Dealers held its fifth annual convention at Sacramento, Cal., Aug. 4 to 8, the attendance being about 200. Eight papers dealing with various phases of co-operation in allied electrical industries were read, and an illustrated lecture on the hydroelectric plants of the Pacific Coast was given by Mr. George Oberton. The meetings were arranged in conjunction with those of the California branch of the National Association of Electrical Inspectors. An extensive entertainment program was provided, and on the evening of the last day of the convention a non-official rejuvenation of the Jovian Order was held.

The newly elected officers of the California Association of Electrical Contractors and Dealers are: President, Mr. C. V. Schneider; secretary, Mr. W. S. Hanbridge; vice-presidents and executive committeemen, Messrs. L. R. Boynton, J. C. Render, Lee Gilpin, Claude Loviday and Frank Somers.

A. I. E. E. Affairs

At the first meeting for the administrative year of the board of directors of the American Institute of Electrical Engineers, held on Aug. 11, President Paul M. Lincoln announced his appointments on the various Institute committees. The chairmen of the committees appointed are: Finance, Mr. J. Franklin Stevens, Philadelphia, Pa.; meetings and papers, Mr. L. T. Robinson, Schenectady, N. Y.; editing, Prof. H. H. Norris, New York; board of examiners, Mr. Maurice Coster, New York; sections, Mr. H. A. Hornor, Philadelphia, Pa.; standards, Dr. A. E. Kennelly, Cambridge, Mass.; United States national committee, International Electrotechnical Commission, Dr. C. O. Mailloux, New York; public policy, Mr. Calvert Townley, New York; library, Dr. Samuel Sheldon, Brooklyn, N. Y.; code, Mr. Farley Osgood, Newark, N. J.; relations of consulting engineers, Dr. L. B. Stillwell, New York; historical museum, Mr. T. C. Martin, New York; membership, Mr. H. D. James, Pittsburgh, Pa.; patent, Mr. Ralph D. Mershon, New York; transmission, Mr. P. H. Thomas, New York; railway, Prof. D. C. Jackson, Boston, Mass.; electric lighting, Dr. Clayton H. Sharp, New York; industrial power, Mr. D. B. Rushmore, Schenectady, N. Y.; telegraphy and telephony, Mr. C. E. Scribner, New York; use of electricity in mines, Mr. Wilfred Sykes, Pittsburgh, Pa.; use of electricity in marine work, Lieut. C. S. McDowell, Brooklyn, N. Y.; electrochemical, Prof. A. F. Ganz, Hoboken, N. J.; electrophysics, Dr. J. B. Whitehead, Baltimore, Md.; educational, Prof. V. Karapetoff, Ithaca, N. Y.

The board elected from its own membership the following members to serve upon the Edison medal committee for two years to fill the places of members whose terms had expired: Messrs. C. O. Mailloux, L. T. Robinson and Charles E. Scribner. Dr. A. S. McAllister was elected for the term of one year to fill a vacancy.

The board also confirmed the appointment by President Lincoln of the following members of the Edison medal committee for five years: Messrs. Charles F. Brush, William Stanley and N. W. Storer.

The following local honorary secretaries were reappointed for a term of two years: Prof. Robert Julian Scott, Christchurch, New Zealand; Mr. Henry Graftio, St. Petersburg, Russia, and Mr. A. S. Garfield, Paris, France.

Cleveland I. E. S. Convention Papers

Although all of the minor details of the program for the Illuminating Engineering Society convention in Cleveland from Sept. 21 to 26, 1914, have not been decided upon, yet an excellent idea of the general character of the convention from the business point of view can be obtained from the list of papers given below:

"Color Variation in Illuminants," "Reflection Standards" and "A Transmission and Absorbing Photometer for Small Areas," by Messrs. Nutting and Jones; "Planning for Daylight and Sunlight in Buildings," by Messrs. Marks and Woodwell; "Present Practice in Machine-Shop Lighting," by Messrs. Powell and Harrington; "The Lighting of a Carpet Mill," by Messrs. Rose and Oakley; "Effect of Room Dimensions on Efficiency of Lighting Systems," by Mr. Ward Harrison; "Illumination of Light Shafts," by Dr. C. H. Sharp; "Artificial Daylight—Its Production and Use," by Messrs. Luckiesh and Cady; "The Development of Daylight Glass," by Mr. E. J. Brady; "Light Filters for Use in Photometry," by Mr. C. E. K. Moes; "Experiments with Colored Absorbing Solutions for Use in Heterochromatic Photometry," by Mr. E. F. Kinsbury; "Notes on the Ulbricht Integrating Sphere and Arc-Lamp Photometry," by Mr. H. K. Chaney; "A New Standard Light Source," by Mr. L. A. Jones; "Some Experiments with the Ferree Test for Eye Fatigue," by Mr. J. R. Cravath; "Relation of Light to the Critical Inspection of Documents," by Mr. A. S. Osborne; "Some Recent Experiments on Vision of Animals," by Mr. H. M. Johnson; "The Locomotive Headlamp," by Mr. J. L. Minick; "Physiological Effects of Light on the Body," by Mr. E. C. Titus; "Characteristics of Gas-Filled Lamps," by Mr. G. M. J. Mackay.

Pacific Coast Electrical Conventions at Spokane

The program for the seventh annual convention of the Northwest Electric Light & Power Association, to be held at Spokane, Wash., Sept. 9, 10 and 11, in conjunction with the meeting of the Pacific Coast Section of the American Institute of Electrical Engineers, has now been determined upon. A preliminary list of papers to be presented at this joint convention appeared in our issue of July 18. Here is the final arrangement:

Sept. 9—Welcome by Mayor Hindley of Spokane; response by Mr. D. L. Huntington, Spokane, Wash.; address by President H. L. Bleecker, Spokane, Wash.; report by Secretary N. W. Brockett, Seattle, Wash. Afternoon—"Rates and Physical Valuation of Public Utilities," by Mr. W. W. Cotton, Portland, Ore.; "Outdoor Substations," by Mr. J. C. Martin; "Electric Power Development on the Pacific Coast," by Mr. W. E. Herring, Seattle, Wash.

Sept. 10—"Organization and Operation of Branch Offices and Plants," by Mr. L. A. McArthur, Portland, Ore.; "Extension of Electric Service Into Small Communities and Rural Districts," by Mr. M. C. Osborn, Spokane, Wash.; "Electric Pumping Plants in Rural Districts," by Mr. J. E. Davidson, Spokane, Wash. Afternoon—"Electrical Appliances," by Mr. H. B. Pierce, Spokane, Wash.; "Rates," by Mr. Stacy Hamilton, Portland, Ore.

Sept. 11—"Public Policy Review," by Mr. F. T. Post, Spokane, Wash.; "Balance-of-Stores System for Lighting Utilities," by Mr. E. A. West, Portland, Ore. Afternoon—"Wrinkles," by Mr. P. A. Bertrand, Aberdeen, Wash. Executive session.

Messrs. L. A. McArthur, P. A. Bertrand, M. C. Osborn, George Quinan and E. A. West form the Northwest association's committee on program.

Following is a revised list of the papers to be presented before the Pacific Coast Section, A. I. E. E.:

"A Distribution System for Power Purposes," by Mr. F. D. Nims, Vancouver, B. C.; "Electrical Application in the Lumber Industries," by Mr. E. F. Whitney, Portland, Ore.; "Operation of the Butte, Anaconda & Pacific 2400-Volt Direct-Current Railway System," by Messrs. J. B. Cox and C. A. Lemmon, Schenectady, N. Y.; "Considerations in the Application and Control of Electric Motors for Gold Dredges," by Mr. G. B. Rosenblatt, Salt Lake City, Utah; "The Effect of Delta and Star Connections Upon Transformer Wave-Forms," by Prof. Leslie F. Curtis, Seattle, Wash.; "Economy in the Operation of 55,000-Volt Insulators," by Mr. M. T. Crawford, Seattle, Wash.; "Work of the Joint Committee on Inductive Interference with Telephone Lines," by Mr. A. H. Griswold, San Francisco, Cal.

The entertainment program for the joint convention includes an opening reception, a Dutch lunch, theater parties and automobile rides for the ladies, an illustrated address on the San Francisco Exposition and the International Electrical Congress, by Mr. A. H. Halloran, San Francisco; a joint banquet, a trip to plants of the Washington Water Power Company at Little Falls and Long Lake, a trip over the Inland Empire Railway Company's system to Cœur d'Alene Lake, etc.

PUBLIC SERVICE COMMISSION NEWS

New York Commissions

Under authority of the New York Public Service Commission, Second District, the Nassau Light & Power Company will reduce its maximum rate for energy for lighting from 15 cents to 12 cents per kw-hr. The Glen Cove Light & Power Company offered to supply Sea Cliff in competition with the Nassau company at 9 cents per kw-hr. After investigation the commission decided that there was no certainty that the Glen Cove company could continue to supply energy in the Sea Cliff territory with profit to itself as it secures its energy from the surplus of a generating plant in an industrial factory controlled by the H. R. Ladew estate, which also controls the Glen Cove company. There is no contract between the two and the industrial plant could increase its charge for energy at any time. The Nassau company agreed to make a maximum rate of 12 cents in all territory served by it.

Indiana Commission

The commission has announced its completed appraisals of the property of the three Indianapolis heating and lighting companies, which are the Indianapolis Light & Heat Company, the Merchants' Heat & Light Company and the People's Light & Heat Company, the last two companies being merged. The valuations were made by the engineering staff of the commission, and are marked "first tentative." The Indianapolis Light & Heat Company, the largest of the three, was given a total cost of reproduction allowance of $4,893,881 and a present value of $3,917,889. In these figures, as in all the valuations, 12 per cent was allowed to cover cost of engineering, superintendence, interest during construction, contingencies, etc. The cost of reproduction of the Merchants' company was given as $2,391,190 and the present value of the company was given as $2,076,638. The People's company was given a cost of reproduction value of $442,898 and a present value of $273,134. The appraisals have been filed with each of the companies and a date for the beginning of the hearings on the petitions for rate revision was fixed for Aug. 20.

Rhode Island Commission

The annual report of the Public Utilities Commission of Rhode Island, covering the calendar year 1913, repeats the belief expressed in its first report that the best results will obtain for both the public and the utilities if a determination of value is made in the first instance, with revaluation from time to time as the same may appear necessary. The commission again recommends the adoption of legislation substantially similar to that of Wisconsin, prescribing the principal portion of the requirements relative to annual reports and physical valuation of the property of utilities.

The commission has not yet prescribed a form of return for utilities other than railways of all kinds, although the matter of such returns by gas and electric-lighting companies has had consideration during the year. Numerous conferences have been held with officials of such utilities, and the commission has ascertained that the methods of accounting in use by these utilities vary to a considerable extent.

The form of standard classification of accounts of the New England Section of the N. E. L. A., that used by the Stone & Webster Management Association and those prescribed by various public service commissions have been under consideration, and undoubtedly during the coming year a form, containing what the commission deems the best features of the various classifications, will be adopted.

Current News Notes

Canadian Niagara Plants Under Guard.—The Canadian Militia Department has sent a detachment of the Forty-fourth Regiment to protect the equipment of the Toronto Power Company, the Ontario Power Company and the Canadian Niagara Power Company.

* * *

Sherman Was Right.—Energy for electric lighting is furnished now in Argentina only until 3 a. m. Train service has also been reduced. This action has been taken in order to conserve the coal supply on hand. Argentina has relied for her coal supply on foreign nations. With shipping tied up on account of the European war the above precaution became necessary.

* * *

For an "All-Electrical Day."—Mr. Robert Montgomery, of the Louisville Gas & Electric Company, whose suggestion for the nation-wide observance of an "electric-vehicle day" was recently noted in this column, explains that his original idea was even more comprehensive, and has now proposed the possibility of an "All-Electrical Day" which the entire electrical industry might take part in celebrating. As the birthday anniversaries of both Franklin and Edison come during the winter months, Mr. Montgomery suggests the date of the first commercial use of the incandescent lamp. It is his idea that electrical firms might grant their employees a half-holiday on that occasion, and that the day be fittingly celebrated with parades, meetings, outings, etc.

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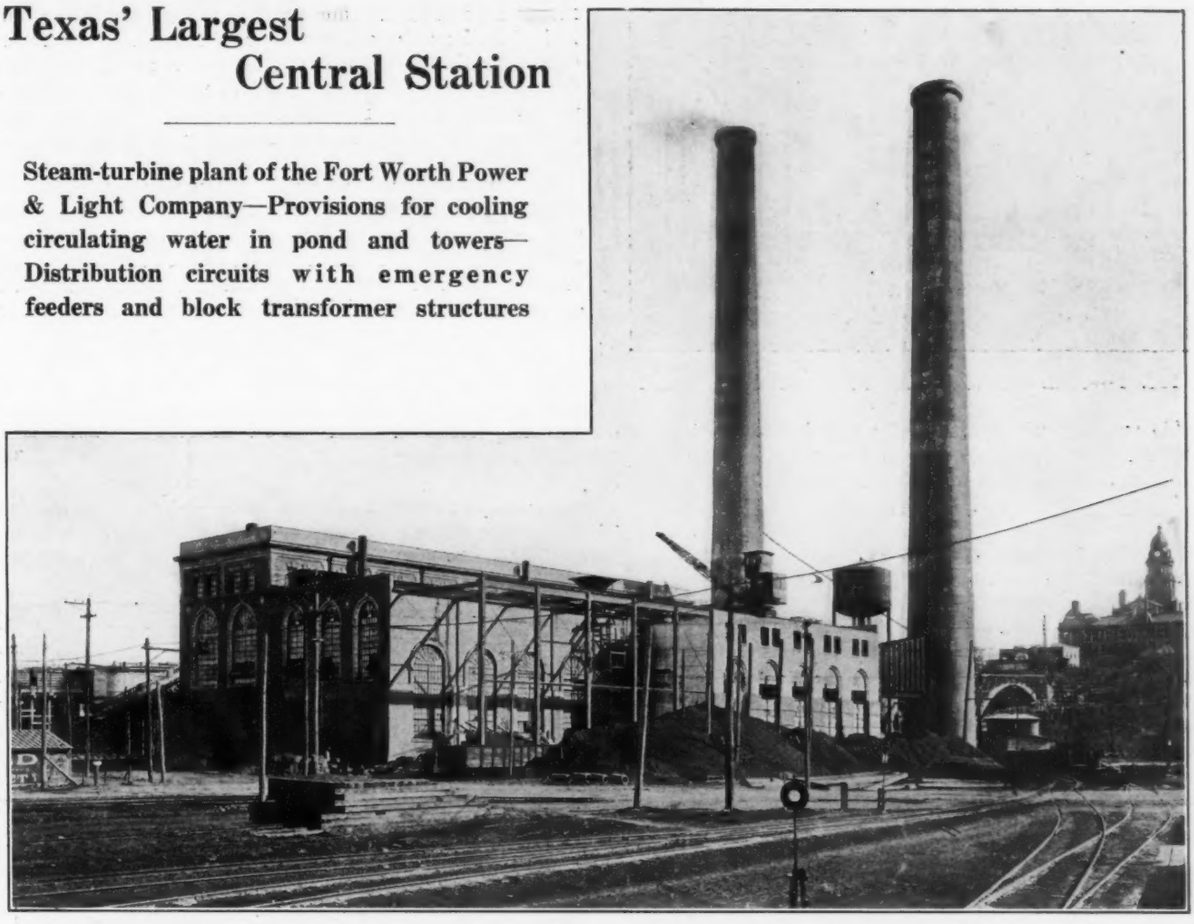
Motion Pictures on Electrical Topics.—In his recent report to the members of the Society for Electrical Development Mr. J. M. Wakeman, general manager, announced that three special reels of electrical motion pictures will be released Aug. 24, two more on Sept. 1, and another the latter part of September. At once upon release these reels start from fifty different centers in the United States and Canada and will be shown in all the large cities. The attention of the society has also been called to an objectionable film now being run, which shows one of the characters accidentally killed by placing his hand on an electric water kettle. Another scene depicts the power house and the alleged accident which the scenario writer imagined could cause such a result. The society, through its Mr. L. G. H. Smith, has pointed out the impossibility of the situation and the injustice to the electrical industry resulting from this film, and has urged the manufacturers to withdraw the film and to prevent others of a similar character from being exhibited.

* * *

Commercial Travelers in South America.—Taxes imposed by South American countries on commercial travelers are far from being prohibitive to the average exporter. While various license fees are prescribed by law in those countries, their purpose, as explained in a report issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce, is chiefly to prevent unfair competition with local concerns, which are themselves subject to similar taxes. By associating himself with some local house the traveler may obtain exemption from all but a few of the more moderate taxes. The rates of license fees and the conditions under which samples may be temporarily admitted free of duty in practically all the countries of South America are shown in the report entitled "Commercial Travelers and Samples in South America" (Tariff Series No. 19A), copies of which may be purchased for 5 cents each from the superintendent of documents, Government Printing Office.

Texas' Largest Central Station

Steam-turbine plant of the Fort Worth Power & Light Company—Provisions for cooling circulating water in pond and towers—Distribution circuits with emergency feeders and block transformer structures



THE largest central-station power plant in Texas is the steam-turbine station of the Fort Worth Power & Light Company, which not only supplies the electric-service needs of its own community but also sells large amounts of energy to the Texas Power & Light Company, operating an extensive high-tension transmission system in the north central section of the State. The present station first went into operation about eighteen months ago with a peak load of 3000 kw. Since that time its load has increased to 13,000 kw, and the construction forces have been busy keeping pace with the rapid growth of the demand for power.

The plant is situated on the west bank of the Trinity River, from which during the major portion of the year its supply of condensing water is drawn, although during the dry season cooling towers must be depended upon as auxiliaries to the operation of the large surface-type condensers for the turbines.

Fuel Supply and Boiler Room

Texas and Oklahoma coals are used as fuel in the Fort Worth plant. From the cars or piles in the fuel storage yard a 68-hp Brownhoist crane with a 36-cu. ft. bucket elevates the fuel to the roof of the bunkers over the boiler room. Here the coal can be either deposited directly into the bunkers or passed first through a traveling crusher which is arranged to move on rails the entire length of the bunker roof. The bunkers are of the Browning suspension type and hold 1200 tons of fuel.

There are fourteen Edge Moor boilers—eight 500-hp units and six 600-hp units. Ordinarily, with the Texas coal provided, these boilers are operated at about 150 per cent of this normal rating. The furnaces are equipped with Green chain-grate stokers with one exception, this one having been fitted up with a Taylor underfeed stoker for purposes of test.

Experiments are also being made with natural-gas firing. One of the chain-grate furnaces has been equipped with forty Kirkwood gas burners which were installed without disturbing the coal-firing apparatus. Each burner is rated to develop 25 boiler-hp. Large receiver chambers are features of the gas supply piping. The gas-fired boiler is being tested for economy of operation compared with coal, and also with respect to the time interval in which it can be put into service in case of emergency. The load on the Fort Worth plant is extremely uniform and regular, but in the event that it is needed steam can be raised in this gas-fired boiler in about seven minutes.

An operating steam pressure of 220 lb. per sq. in. is employed and Foster superheaters furnish 150 deg. superheat. Hoppe feed-water heaters heat the boiler supply, utilizing the waste thermal units in the exhaust from the auxiliaries. The boiler-feed pumps are turbine-driven. All feed-water entering the boilers is measured.

Stacks and Ash-Handling Equipment

Each row of boilers is connected through a metal breeching to one of the 256-ft. reinforced-concrete stacks which carry aloft the products of combustion. These stacks are lined with firebrick all the way from a point 4 ft. below the breechings, and at the top they measure in inside diameter 13 ft. and 15 ft. respectively.

From a gallery beneath the firing aisle the ashes are raked from the furnace ash-pits into hoppers leading to the vacuum-conveyor system which transports the ashes to a two-car ash tank. A five-car ash tank is now also under construction.

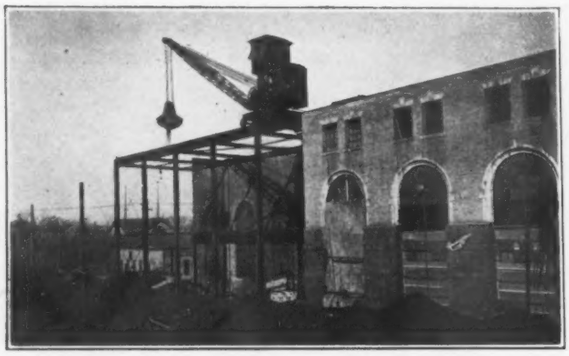


FIG. 1—COAL-STORAGE PILES AND TRAVELING HOIST

To supplement the present ground storage piles, an under-water fuel storage pit is being built on the plant property. This pit will be of reinforced concrete and will hold 6000 tons. It will measure 215 ft. long, 32 ft. wide and 30 ft. deep, and will be spanned by a Whiting crane equipped with a 54-cu. ft. bucket.

Special attention has been given to flue-gas analysis and to the improvement of operating efficiency in the boiler room of the Fort Worth plant. Provision is made for tapping the flue gases from each furnace and for making a continuous test of the average carbon-dioxide content of the units in service. Draft gages are provided for noting the conditions of combustion and each boiler and principal steam line is tapped for steam-flow meter connections. A completely equipped laboratory is installed on the ground floor of the station and here experienced chemists and engineers are in charge. Operating reports and analyses of plant losses are compiled daily, and each element of loss is studied in detail and every effort directed at reducing the magnitude of the separate items.

Three 1200-ft. wells furnish the water supply of the station. These wells are located near the plant and are pumped by the air-lift method. Compressed air at 150 lb. pressure is furnished by a pair of Ingersoll-Rand two-stage compressors, one steam-driven and the other operated by a 235-hp Westinghouse synchronous motor.

Generating Units in Turbine Room

One 5000-kw and two 4000-kw General Electric horizontal turbo-alternators comprise the prime power units. These machines deliver 4000/2300-volt, sixty-cycle, three-phase energy and have their neutrals solidly grounded. There are three 100-kw exciter sets, two being turbo-driven, while the third is directly connected to a 4000-volt induction motor. The last-mentioned set ordinarily supplies excitation energy, while the first two are retained for starting service.

The large turbines exhaust into Alberger surface-type condensers, the main exhaust lines being controlled by 72-in. motor-operated valves. During the season of flow in the Trinity River circulating water for the condensers is obtained from this stream. By impounding the river at a point near the plant a cooling pond is formed.

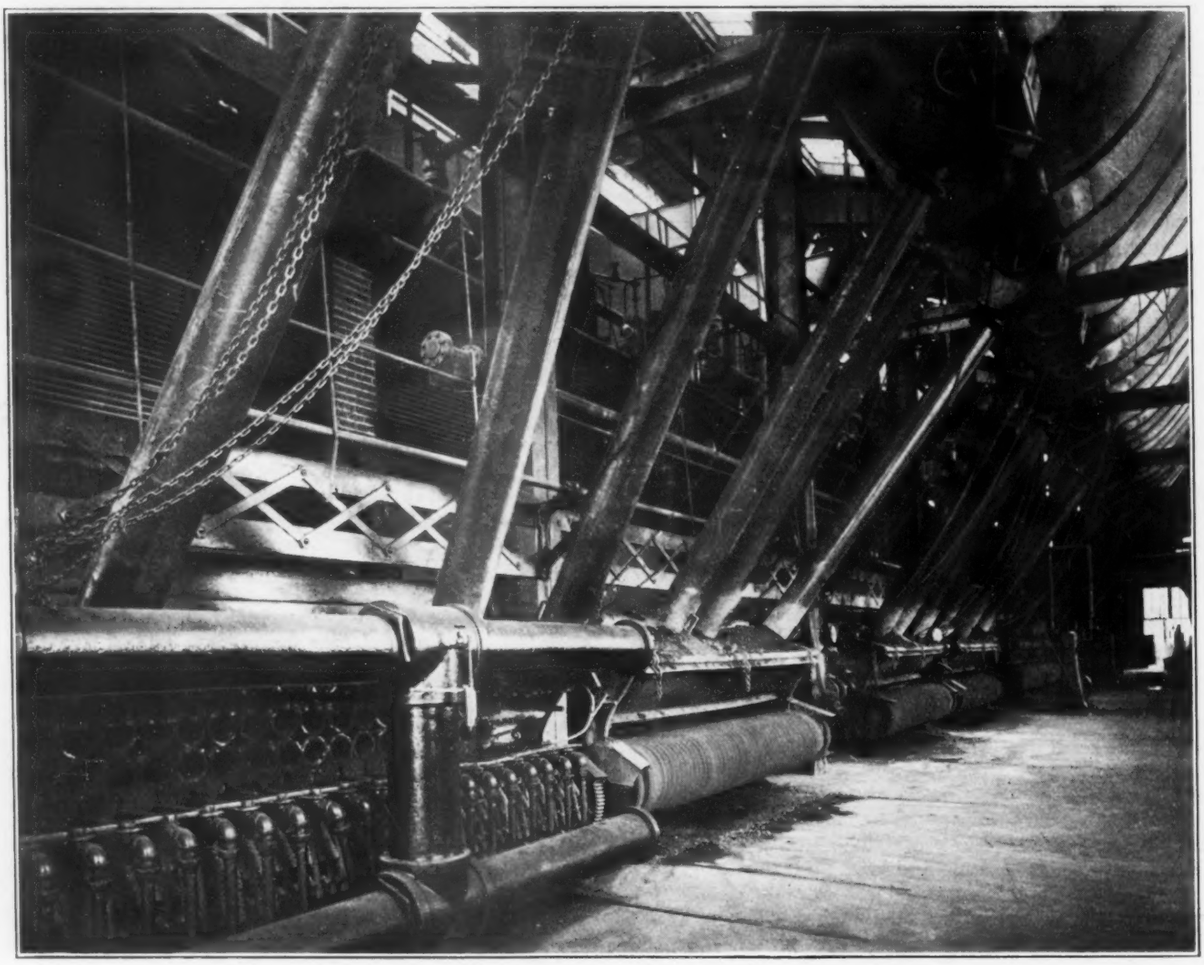


FIG. 2—BOILERS EQUIPPED FOR GAS AND COAL FIRING

FIG. 3—TURBINE ROOM OF THE FORT WORTH STATION

Water coming from the condensers is discharged into the river at a point about 600 ft. above the dam where the intake is situated. This intake pipe opens into the lowest part of the pond, thus obtaining the coolest water, while the hot water, which remains near the surface, passes off over the spillway. The circulating pumps are installed in a pump house in the plant yard, and are all electrically driven by vertical-shaft motors. There are an 11,000-gal. pump operated by a 100-hp motor and a pair of 6000-gal. pumps driven by 75-hp motors.

At certain seasons of the year, as already noted, the flow in the Trinity River at Fort Worth practically ceases altogether, and resort must then be had to the cooling towers, of which there are four installed. These are of the Alberger type and are to be supplemented by another Alberger tower and a Worthington tower. When the cooling towers are in operation turbine-driven booster pumps are required to assist the motor-driven circulating pumps. These booster pumps are of the same ratings as the circulating pumps, namely, 11,000 gal. and 6000 gal. per minute.

Duplicate 4000-Volt Bus

For flexibility in operation the 4000-volt station bus is arranged in duplicate. By means of the motor-operated General Electric H-3 2000-amp, 15,000-volt "machine switches," any generator can be thrown onto either bus. A similar "synchronizing switch" serves to tie the two buses together when that is desired. The outgoing feeders are arranged in groups, each controlled by a group switch by means of which connection can be made to either bus. The group switches are of the motor-operated type similar to the machine switches but are mounted on the overhead switchboard gallery. The individual feeder switches are of the General Electric K-12 solenoid-operated type and are installed with the machine switches and bus structure just beneath the switchboard gallery. The 6000-kw and two 1500-kw transformer banks serving the 60,000-volt transmission line also have their individual switches leading from the station buses, and connections are furthermore made for station lighting and power and for the motor-driven exciter set. The exciter bus, it is of interest to add, is also installed in duplicate, so that separate excitation systems can be operated if advisable.

One of a pair of 5-kw motor-generator sets ordinarily energizes the operating bus, but in case of interruption to this supply an automatic switch connects in circuit an 80-amp storage battery, thus insuring that energy will always be available for operating relays and switches. This battery is made up of 104 vehicle-type Edison cells.

FIG. 4—HATCHES OVER COAL BUNKERS

FIG. 5—DAM, COOLING POND AND FOREBAY

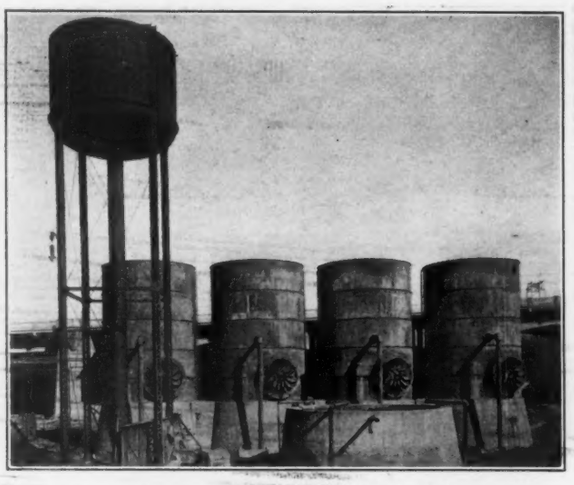


FIG. 7—COOLING TOWERS AND WATER-SUPPLY TANK

Among the curve-drawing instruments on the switchboard not ordinarily found in similar plants are recording frequency meters, recording voltmeters, recording wattmeters and recording power-factor meters. The machine panels are also equipped with wattless-component meters in addition to the usual ammeters and kilowatt-hour meters. The method of totalizing the output of the several machines is also rather novel, the secondaries of the individual instrument transformers being paralleled to give the total reading required, although the machine circuits themselves are carried separately to the bus switches.

The turbine room is spanned by a 50-ton Cleveland crane with a 5-ton auxiliary. Twenty two-lamp groups of 250-watt tungsten units furnish the lighting.

In over-all dimensions the Fort Worth power plant building measures 136 ft. wide by 291 ft. long.

Underground Distribution in Business District

Much attention and interest have been attracted by the novel scheme of distribution employed in the underground district of Fort Worth. Four feeders of No. 1 to No. 4/0 cross-section supply the region within the fire limits. These feeders, along with other circuits, are all taken overhead on steel-tower structures across the river bottoms to the terminal house on the edge of the river bluff where the underground construction begins. From the terminal house the four 4000-volt feeders, together with a "spare" No. 4/0 three-conductor cable, are taken in fiber conduit up Throckmorton Street, which parallels the main street of the city at a distance of two blocks.

At every second street one of the feeders ends at a double-throw hand-operated oil switch which connects it to the "lateral" feeding "crosstown" in both directions. The other throw of the same oil switch connects the lateral to the spare feeder cable which is tapped in in this way to one side of each of the Throckmorton Street switches. In event of accident to the feeder for a given district a troubleman can be dispatched to the switch at the Throckmorton Street intersection with the lateral, and by transferring the circuit over to the spare feeder service can be quickly restored.

Laterals and Transformer Structures

Coming now to the laterals under the crosstown streets, these circuits are tapped at each alley intersection by two "branch-offs," one leading to each of the transformer structures serving the block on its side. As shown in Fig. 9, these transformer structures comprise a pair of tubular steel poles supporting a steel platform on which the transformers are set. The structure is installed in the alley opening just outside the building line. From the transformers the secondary lines are carried down the alley on poles, brackets, etc. Each transformer structure in this way serves one city block and each branch-off serves two transformer structures. A given lateral thus supplies a sec-

FIG. 6—BUS STRUCTURE AND OIL-SWITCH COMPARTMENTS

FIG. 8—GENERATOR, GROUP AND FEEDER OIL SWITCHES

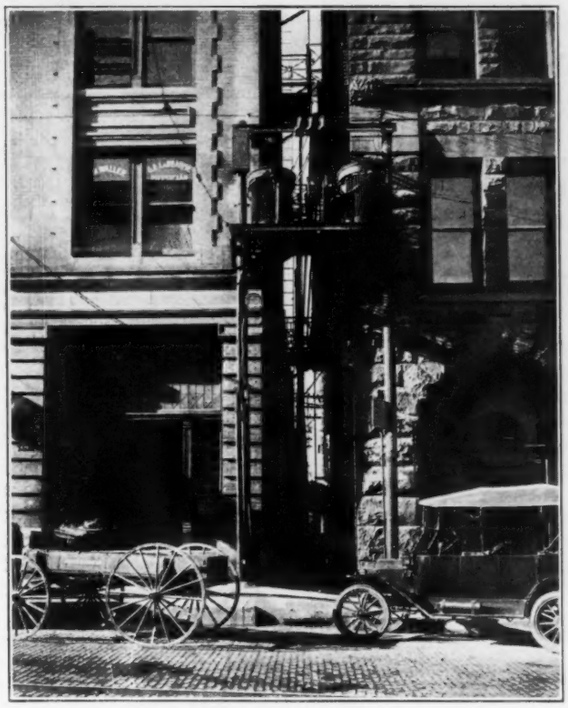


FIG. 9—TRANSFORMER STRUCTURE AT ALLEYWAY

tion two blocks wide across the fire district. The hand-operated double-throw oil switches at the Throckmorton Street intersections are inclosed in heavy pedestal castings and despite their necessary size are quite inconspicuous. They are locked against tampering, but keys are carried by each member of the company's operating staff.

Transformers are connected both delta and star on the three-phase feeders, while a number are also arranged in the Scott relation to supply two-phase energy for the large number of alternating-current motors of this type remaining on the company's circuits. This two-phase equipment remains from the former two-phase motor service which was furnished exclusively by the predecessor of the present plant.

There is in addition a 500-volt direct-current "power" circuit which is supplied from a pair of 500-kw six-phase rotary converters in the power house. This circuit is operated ungrounded. The duplicate 400,000-circ. mil feeders which supply this 500-volt energy are arranged in duplicate, taps to both feeders being brought up to a double-throw switch on each transformer structure. In this way the 500-volt motors in

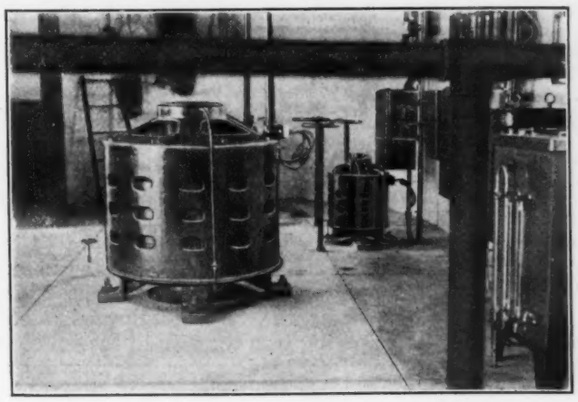


FIG. 10—MOTOR-DRIVEN CIRCULATING PUMPS

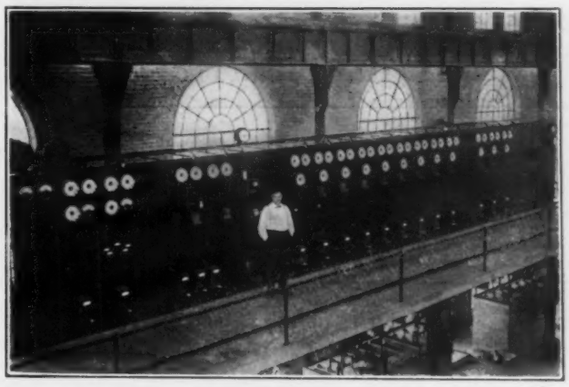


FIG. 11—SWITCHBOARD GALLERY

the local block may be fed from either line in case of accident to the other. In addition, the transformer structures also carry the usual lightning-arrester equipment, and in some instances watt-hour meters recording the consumption of the nearby "white-way" lighting on Main Street.

Energy is delivered to the 60,000-volt transmission system of the Texas Power & Light Company over three banks of transformers—one 6000-kw group and two 1500-kw groups. The oil switches are of the General Electric solenoid-operated type and are rated at 150 amp and 70,000 volts.

The plant and city distribution system described were designed and built by the Cleveland Construction Company, Cleveland, Ohio, Mr. Hugh Cook being resident engineer at Fort Worth.

Mr. A. J. Duncan, Jr., is president and general manager of the Fort Worth Power & Light Company. Mr. W. G. Riddle is chief engineer in charge of the plant.

FIG. 12—CURBSIDE FEEDER SWITCH

Hydroelectric Station on the Cuyahoga River

A three-unit, 1800-kw hydraulic station at Great Falls operating in conjunction with an 18,900-kw steam plant near Akron, Ohio

THE hydroelectric station of the Northern Ohio Traction & Light Company at the Great Falls of the Cuyahoga River operates in conjunction with a steam station on the same river. The Cuyahoga from the town of Benton to Hiram Springs, a distance of 8 miles, flows in a deep channel through a beautiful valley varying from 0.5 mile to 2.5 miles in width. Legend has it that small tribes of Indians habitually spent the severe months of the winter in a sort of cave formed by an overhanging ledge less than 100 yd. below the Great Falls. Later, on account of the peculiar formation of rock strata in the cave it became known as the "Old Maid's Kitchen," and it is almost before the door of this historic cavern that a hollow-concrete-steel dam, 52 ft. in exposed height and 100 ft. across its top, has been erected. The pond created by this hydro-gravity dam, when the water stands at the crest, is 35 acres in area and represents an available storage reservoir containing 35,000,000 acre-ft. of water. Records show that the actual discharge of the river has fluctuated from 0.8 cu. ft. to 9.2 cu. ft. a second. The drainage area tributary to the hydroelectric development amounts to approximately 400 sq. miles, and from this district the mean annual run-off ratio has been found to be 1 cu. second-ft. per square mile of tributary drainage area. Referred to sea level the dam crest is at an elevation of 910 ft., and as the river elevation at the upstream boundary of the company's property is at 911, a slope of 1 ft. is allowed in the pond above the dam. In the tail channel the river elevation at the power house is 805, and the effective fall for the development equals (911 — 805) — (friction head + velocity head, 5 ft.) — 1 ft. lost at turbine entrance and draft-tube efflux, equaling an effective head of 100 ft.

2760-Ft. Steel Penstock from Dam to Power House

The diversion conduit is a 90-in. riveted steel-plate pipe with its intake, situated on the upstream side and at the south end of the dam, properly guarded by trash racks. A motor-driven gate valve operated from the power house controls the inflow into the pipe. Concrete benches spaced 10 ft. apart support the pipe throughout its entire length of 2760 ft. One manhole, an air valve, a mud sluice and an expansion joint are provided for each 1000 ft. of its length. This circular steel penstock terminates in a riveted-steel-plate receiver at the power house, where a relief valve is provided. The thickness of the steel plate is 0.3125 in., and the weight of pipe with rivets is 440 lb. per linear foot. The expansion joints offer ample safety against temperature influence, while two surge tanks and the relief valve represent duplicate insurance against damage from water hammer. One coat of hot asphalt and two of graphite paint have been applied, which, it is estimated, will serve five years without renewal. The useful life of the pipe, if recoated every fifth year, is estimated at from thirty to forty years. The per cent of silt carried by the Cuyahoga River water is not sufficient to affect the capacity of the pipe or its durability.

Generating Station and Electrical Equipment

The power house is erected on rock foundation at the downstream boundary of the company's property, the substructure consisting of the head wall, which supports the pipe receiver, two side walls, pits and a concrete-slab floor extended downstream about 50 ft. to form an apron for the outflowing water. All substructure walls are of monolithic concrete construction bedded on rock. Brick walls and a steel-framed roof with corrugated-iron covering complete this fireproof structure. As it stands the power house measures 35 ft. by 47 ft. inside, but the building can be increased in length to house additional units.

Three hydraulic turbines of the Francis type compose the prime-mover equipment furnished by the Trump Manufacturing Company, of Springfield, Ohio.

FIG. 1—DAM ON THE CUYAHOGA RIVER

The rating of each turbine is based upon a guaranteed efficiency of 80 per cent from three-fourths to full-gate openings, developing from 5000 minute-ft. (83.33 cu. ft. a second) of water and a shaft speed of 500 r.p.m., 750 hp. These turbines are of the so-called high-head reaction type, a comparatively recent development secured by the adaptation of the Francis turbine characteristics to the American reaction turbine design. A steel frame anchored to the concrete-steel floor supports the turbines, generators and a 2500-lb. flywheel. The hydraulic governors are of the Woodward oil-pressure relay type. Water is supplied to the turbines through feeder pipes from the receiver. Each of the 54-in. riveted-steel feeder pipes is equipped with a motor-driven valve gate. After passing through the 28-in. runners the water leaves the turbines through steel-plate draft tubes emptying into the pits in the tailrace. The draft tubes are 6 ft. in diameter, curving downstream and flaring at their efflux ends.

The 720-kva, 2800-volt, three-phase, sixty-cycle generating equipment consists of three Westinghouse

alternators directly connected to the horizontal water-wheel shafts. Excitation for the main generators is supplied by two 40-kw, 125-volt exciter sets placed near the east wall of the station. One of these machines is belted to an outboard pulley on the generator end of main unit No. 3, while the other is directly connected to a 60-hp, 2200-volt induction motor operating at 850 r.p.m.

The six-panel black-slate switchboard, the high-tension bus and switching equipment, and three 600-kva, 2200/22,000-volt, three-phase transformers for increasing the potential of outgoing energy are installed along the north station wall. All switching apparatus on the board controlling circuits operating at a potential of 2300 volts or more is of the manually operated, remotely controlled type. A three-phase oil switch connecting the high-tension side of the step-up transformers to the outgoing transmission line is not controlled from the switchboard, but from a lever mounted on the switch rack. The entire equipment of the station being on one floor in a single room makes it possible for the 10-ton traveling crane to serve all apparatus.

Tie Line and Transmission Lines

About 0.75 mile upstream is the main steam generating station of the Northern Ohio Traction & Light Company, which is known as the Gorge steam station (described in the *Electrical World* Aug. 30, 1913). The present installation in the steam station consists

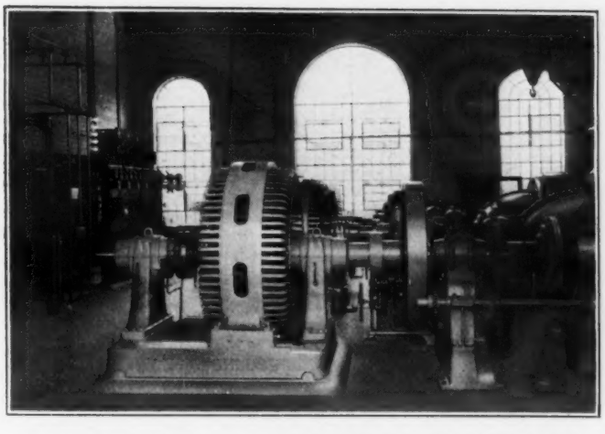


FIG. 2—ELECTRICAL EQUIPMENT IN HYDROELECTRIC STATION ON THE CUYAHOGA RIVER

of three Westinghouse 6300-kw, 2300-volt, sixty-cycle turbo-generators, and this equipment is operated in parallel with that of the water-power station, connections being made on the 22,000-volt bus. Leaving the hydroelectric station, a No. 00 copper line ascends the steep bluff to a roadway cut on the side of the hill. From here a line of 35-ft. wooden poles carries the leads to a point about 0.25 mile distant, from which place the circuits continue to the steam station on steel towers. In connection with the wooden-pole line it is interesting to note the peculiar type of construction employed. To safeguard the high-tension circuit and the smaller wires leading to the intake house at the dam, four 0.5-in. steel messenger wires have been strung at 18-in. intervals on an angle-iron cross-arm at the top of the pole. This precaution has been found valuable for fending off falling branches blown from trees higher up the neighboring hillside.

A railroad was built to provide a means of hauling material and machinery to the site of the hydroelectric station and is now used for hauling supplies. In speaking of the difficulties encountered in building the plant, Mr. W. H. Roberts, superintendent of motive power, said that the construction of the electric railroad had indeed been wise, as the saving in haulage expense and in time had amounted to more than the cost of the road.

Mr. Charles Currie is vice-president and general manager of the Northern Ohio Traction & Light Company, and in his work he is assisted by Mr. W. H. Douglas, general superintendent, and Mr. W. H. Roberts, superintendent of motive power. Mr. E. C. Stakes is chief operating engineer at the Gorge station and the hydroelectric plant.

Switchboard Connections for Making Commercial Transformer Tests

The Commonwealth Edison Company of Chicago makes a practice of testing a certain percentage of all shipments of new transformers for such characteristics as excitation, core loss, no-load ratio of transformation, polarity, temperature rise under load, and impedance. As the number of transformers to be tested each month is considerable, a special equipment has been rigged up for this purpose alone and a switchboard has been designed to simplify the making and changing of connections. The latter is so arranged that practically all of the above tests can be made by simply throwing switches. The arrangement works out so well that it is described here in some detail for the benefit of other companies that may desire to test their transformers in a similar fashion. Such tests may be made either when the transformers are new or when they have been in service for some time.

A photograph of the switchboard is shown in Fig. 2 and the corresponding wiring diagram in Fig. 1. The board provides for the simultaneous testing of two similar transformers and provides both alternating-current and direct-current energy. Before taking up the details and connections of the several tests it will be necessary to examine the general lay-out of the switchboard.

General Layout of the Board

The power supply section of the board is shown at the left in Figs. 1 and 2. The upper corner contains the alternating-current terminals and fuses, and the lower corner the direct-current terminals and fuses. This section is supplied with direct current from a storage battery and with alternating current from a variable-frequency motor-generator set. A double-throw switch M when closed in position 1 puts alternating-current voltage on the busbars through the ammeter I_1; while in position 2 it puts direct-current voltage on the bars through ammeter I_2. These ammeters may be cut out by means of short-circuiting switches.

In the main section of the board there are three double-pole switches A_{1-2}, B_{1-2} and C_{1-2}, which make connection with the secondary windings of the No. 1 transformer, and three similar switches A_{3-4}, B_{3-4} and C_{3-4} for transformer No. 2. A_{1-2} and A_{3-4} when closed to the left apply voltage to the primary windings of transformers 1 and 2 respectively. At the same time auxiliary contacts installed behind the switchboard connect pairs of high-tension terminals of the two transformers respectively to P_2 and P_3, which are two of a row of potential terminals in the middle of the board to which a voltmeter can be conveniently connected. Of these voltmeter lugs, P_1 gives busbar voltage; P_2 and P_3 give primary voltages through protecting switches forming integral parts of A_{1-2} and A_{3-4}; P_4 and P_5 give secondary voltages on the respective secondary coils of the No. 1 transformer, and P_6 gives the total secondary voltage; P_7, P_8 and P_9 give the same voltages

for transformer No. 2 as do P_4, P_5 and P_6 respectively.

In the right-hand position, switches A_{1-2} and A_{5-6} supply energy to the centers of the B or transfer switches by means of which the two secondary coils of each transformer can be connected in series, or the connections can be transferred to the C switches. The C switches allow energy to be supplied separately to the two secondary windings of each transformer. In the left-hand position A_{1-2} and A_{5-6} make two connections on the rear of the board by means of auxiliary four-pole switches operated by studs projecting through the board. In each auxiliary switch two poles make a current connection furnishing energy to the primary winding of the transformer. The other poles connect the pressure terminals P_2 and P_3 respectively to the same points. As previously explained, this is a safety switch as it is provided to prevent accidental high-tension short-circuits.

A reversing switch, A_{3-4}, provides for connecting in a standard-ratio transformer in one direction or the other. This transformer draws energy through switch A_{1-2} when this is closed to the right. Ammeter I_3 is included in the circuit.

Connections on the primary sides of the transformers are made by means of the H switches on the right-hand side of the board. H_1 puts voltage on the primary of transformer No. 1 when A_6 and B_2 are closed. H_2 puts voltage on the primary of the standard-ratio transformer. H_3 and H_4 are for the load-back test and are so arranged as to connect the primaries of transformers Nos. 1 and 2 in parallel, and in one lead the low-tension bus, an ammeter and a lamp-bank are in series. H_3 and H_5 provide for connection of the primary coils of the two transformers and the standard-ratio transformer in parallel for measurement of cross-current.

Along the top of the board are studs with short-circuiting switches for the insertion of lamp-bank resistors, and along the bottom are terminals for four ammeters, a wattmeter (current and potential coils) and two voltmeters. Terminals V_1 are permanently connected across the secondary coils of transformer No. 1, while terminals V_2 and V_3 are connected by flexible cables, passing through holes P and P and terminating in clip-blocks by means of which they may be connected with the several voltmeter studs, 1 to 9. Terminals V_4 are used for core loss only.

The transformers under test are located in a room adjacent to that containing the switchboard and the connections are made through flexible cables. The leads from each transformer are brought out separately and are labeled and arranged symmetrically in such a manner as to suggest the proper connections. Pressure wires are brought out from all transformer terminals so as to insure correct voltage readings.

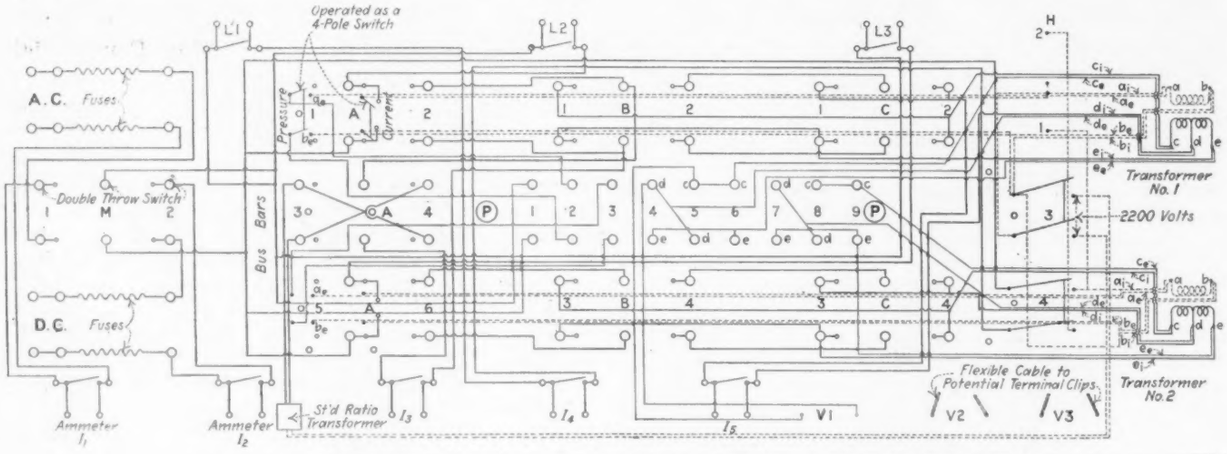


FIG. 1—CIRCUIT CONNECTIONS OF SWITCHBOARD FOR TESTING TRANSFORMERS

CHART SHOWING SWITCH CONNECTIONS FOR VARIOUS TESTS

Test	Transformer Windings Connected	Switches Closed or, in the Case of Short-Circuiting Switches, Open	Instrument Connections		
			Core Loss	Voltage	Current
Exciting transformer	Upper bank: Upper coil	M_1 A_2 B_2 C_2 I_1 I_4	I_4 V_1	V_3 P_4	I_1
	Upper bank: Lower coil	M_1 A_2 B_2 C_1 I_1 I_4		V_2 P_5	I_1
	Upper bank: Coils series	M_1 A_2 B_1 I_1		V_2 P_6	I_1
	Lower bank: Upper coil	M_1 A_6 B_4 C_4 I_1		V_2 P_8	I_1
	Lower bank: Lower coil	M_1 A_6 B_4 C_3 I_1		V_2 P_7	I_1
	Lower bank: Coils series	M_1 A_6 B_3 I_1		V_2 P_9	I_1
Load back		M_1 A_{2-6} B_{1-3} H_{2-4} I_1 L_{2-3}		V_2 P_6	I_4
Low-tension resistance	Upper bank: Upper coil	M_2 A_2 B_2 C_2 I_2 I_5 L_2		V_3 P_4	I_2
	Upper bank: Lower coil	M_2 A_2 B_2 C_1 I_2 I_5 L_2		V_3 P_5	I_2
	Upper bank: Coils series	M_2 A_2 B_1 I_2 L_2		V_3 P_6	I_2
	Lower bank: Upper coil	M_2 A_6 B_4 C_4 I_2 L_5		V_3 P_8	I_2
	Lower bank: Lower coil	M_2 A_6 B_4 C_3 I_2 L_5		V_3 P_7	I_2
	Lower bank: Coils series	M_2 A_6 B_3 I_2 L_5		V_3 P_9	I_2
High-tension resistance	Upper bank	M_2 A_1 L_2		V_3 P_2	I_2
	Lower bank	M_2 A_5 L_5		V_2 P_3	I_2
Cross-current	Upper bank	M_1 A_2 B_2 C_1 or 2 A_3 or 4 L_2 A_6 B_4 C_4 H_1 & 3 (Regulate voltage with I_4)		V_2 P_4 & 5	I_3

Operation of the Board

The simplicity of operation of the board can be illustrated by means of a brief description of the more important tests. For exciting current and core-loss measurement switches M_1, A_2, B_2 and C_2 are closed, exciting the upper coil of transformer No. 1. Ammeter I_1 gives the exciting current, and a wattmeter connected across I_1 and V_1 the core loss. The voltage is measured at V_2 with a flexible connection to P_3. Throwing switch C from right to left gives the connections for an excitation test on the lower coil, the voltage clips merely being transferred to P_4. With switch C open and B closed to the left excitation can be obtained with the coils in series.

For a load-back or opposition test of the two transformers, the switches closed are M_1, A_2, A_3, B_1, B_3, H_2 and H_4. The low-tension coils are then in parallel on the alternating-current supply and the high-tension coils are in opposition. Losses are supplied to the high-tension winding at low voltage and are measured by means of a wattmeter connected at I_1 and P_1.

Resistance tests are made with direct current. For example, to obtain the resistance of the upper coil of transformer No. 1, switches M_2, A_2, B_2 and C_2 are closed. Current is measured at I_2 and is controlled by lamp-bank L_2. Voltage is measured at V_2 through studs P_3. Power can also be measured as a check at I_5 and V_3.

Tests for ratio of transformation are made by banking the transformers under test with the standard-ratio transformer and measuring the cross-current. This test also checks polarity. For these purposes switches M_1, A_2, B_2, C_1 or C_2, A_3 or A_1, A_3, B_4, C_4 and H_3 and H_1 are closed, the transformer in the lower bank being used to excite the primary coils of transformer No. 1 and the standard-ratio transformer. Increase of current at I_3 when switch H_3 is closed indicates the presence of cross-current and its magnitude.

The only tests which require disconnection of transformer cables are those for load loss of a single transformer and for impedance. These require the short-circuiting of the secondary leads. The load-loss test can be made in a working day by starting it at 8 a.m. Regulation is calculated from the measured impedance by the method described by Lloyd and Agnew in the *Bulletin* of the National Bureau of Standards.

A practical insulation test is made by doubling the voltage through doubling the frequency by which expedient the core flux is not increased. The company considers this test more reliable than one in which the voltage is supplied from an outside source, because the test more nearly duplicates practical over-voltage conditions. The usual insulation tests are also made.

The accompanying chart summarizes the connections and positions of the switches for the important tests.

In the foregoing account no attempt has been made to exhaust the possibilities of the testing equipment. Enough has been said, however, to indicate how, by careful study of operating conditions, the routine of testing may be simplified. In fact, only by the use of some such plan is the actual testing of a large transformer equipment practicable. Transformers up to 25 kva capacity are tested. Not only are samples of all new transformers put through these tests, but the studies made are of great value in connection with transformers injured in service. For example, during 1912 274 preliminary and 396 final tests were made.

The transformer test is a part of the general testing laboratory described in the *Electrical World* of Jan. 3. This laboratory is in charge of Mr. E. O. Schweitzer, chief testing engineer.

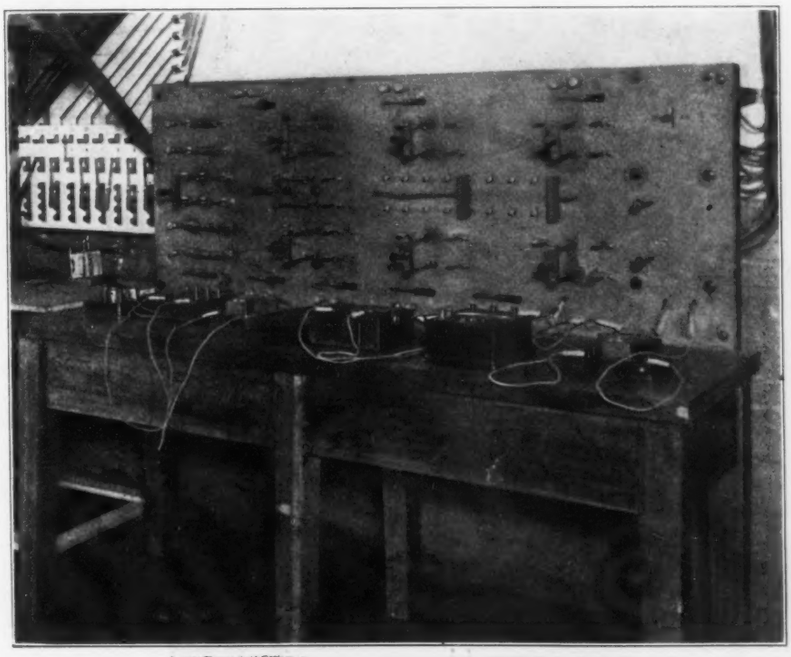


FIG. 2—SWITCHBOARD FOR ROUTINE TRANSFORMER TESTS

Nitrogen-Filled Street Lamps for Chicago

Mention was made in the issue of July 11 of the fact that the Westinghouse Lamp Company was awarded the contract by the Sanitary District of Chicago for nitrogen-filled series tungsten street lamps with auto-transformers and fixtures, to be used for street lighting in Chicago. The total number of lamps to be furnished under this contract will be not less than 2000, but the Sanitary District has the right to purchase during 1914 at prices specified in the contract 8000 additional lamps in lots of 1000, as ordered by the District's electrical engineer.

Division A provides for compensators, with globes and fixtures complete, and Division B for nitrogen-filled series tungsten lamps complete. The prices for furnishing and delivering the compensators, with glassware and fixtures complete, range from $13.60 to $13.45 each, according to quantity. The prices for furnishing the lamps range from $4.50 to $3.655 each, depending on the quantity taken. Thus the units will cost $18.10 each for the first 2000, the price being reduced for a greater quantity, so that if 10,000 units are used it will be $17.105. Sixty-cycle energy will be supplied to the lamp circuits, which will be of both the 6.6-amp and 10-amp types. The manufacturer guarantees the average total life of the lamps to be 1000 hours.

Mr. E. B. Ellicott, the electrical engineer of the Sanitary District, thinks that there is no question of the usefulness of the new lamps for residence-street lighting. He believes, however, that the flame-arc lamp still has a field in lighting business streets.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

Threshing with Electricity in Iowa

By F. S. Dewey

It has not been a very long time since the farmer was accustomed to do his threshing with the old-fashioned flails, when the grain was beaten out on the threshing floor. Then came threshing machines operated by horse-power through sweeps. The next development in power for the threshing machine was the steam engine. And at the present time, while the steam engine and the gasoline engine are contesting for supremacy, the electric motor is making its appearance in the agricultural field. The reason for the farmer adopting this method of doing his threshing is its lower first cost, as well as the reduction in operating expenses secured. The fire hazard is also eliminated, there being no danger from cinders thrown from the engine smokestack or ashes with live coals being left on the ground under the engine.

The Muscatine Lighting Company, of Muscatine, Ia., is now furnishing the towns of Blue Grass, Walcott, Stockton and Durant, Ia., with electric energy for both motors and lighting. Along the 33,000-volt transmission line which feeds these towns there is installed a 2200-volt primary line on the same poles and beneath the 33,000-volt feeders. From this 2200-volt line the enterprising farmers along the route have availed themselves of the opportunity to secure electric energy for power and light. Between Walcott and Stockton there is an association of farmers who own their own threshing machine. As the steam engine that they had used in the past was getting old and some other apparatus for furnishing power would soon be necessary, they decided to give the electric motor an opportunity to prove its merits.

The electrical equipment consists of a 30-hp, 220-volt, sixty-cycle, single-phase Wagner motor complete with rails and pulley. The motor operates at 1165 r.p.m., but there are provided three different sizes of pulleys in order to obtain three different speeds, as the proper speed of the cylinder is determined by the kind and condition of the grain being threshed. The transformer is a 25-kva General Electric unit stepping down to 220/110 volts secondary, the primary being equipped with two 5 per cent taps.

The transformer is mounted in ahead of the motor, on the truck of what was once a road grader, as shown in the illustrations. Energy is fed to the transformer over a temporarily installed line which is connected to the 2200-volt feeders. Mounted on the rear of the truck is a temporary ladder pole with cross-arm carrying the 2200-volt wires to the transformer. Also mounted on the pole are two Garton-Daniels lightning arresters, for the protection of the transformers. Mounted on the side of the truck on a wooden frame is a two-pole, double-throw switch along with the motor starter. The double-pole, double-throw switch is used in order that a large-capacity fuse for the starting of the motor may be employed, and as soon as the motor has reached full speed the switch is quickly thrown to the smaller capacity or running fuse. This affords better protection to the motor from overloads.

RESULTS OBTAINED FROM ELECTRIC THRESHING

	Bushels	Kw-hr.	Kw-hr. per Bushel
Barley	1150	140	0.1217
Oats	1125	73	0.0649
Barley	1800	278	0.154
Barley	1045	160	0.153
Barley	1375	170	0.123
Barley	1045	160	0.153
Oats	720	67	0.093

FIG. 1—ELECTRIC THRESHING NEAR MUSCATINE, IA.

To render the field apparatus safe to touch a 1-in. galvanized iron rod, 5 ft. long is driven into the earth at each setting. To this rod, by means of clamps, are grounded the transformer secondary neutral, the frame of the transformer, the motor and the truck. In this manner ample protection is secured.

The threshing machine used is one built by the Avery Manufacturing Company. The cylinder measures 32 in. with a 54-in. separator. In threshing barley a cylinder speed of about 1100 r.p.m. has been found to be most satisfactory. One of the advantages discovered for the electric motor is that the constant speed obtainable does not carry the grain over into the straw pile, whereas with the steam engine, when grain is damp, the speed has to be increased in order to run the grain through, and in doing this some of the grain is carried over.

In the table herewith is a list of the different threshing jobs handled, and the results obtained.

The cost of a complete equipment such as described above was $800, while a steam or gasoline engine outfit of the same capacity would cost from $1,800 to $2,500.

It is figured that with electric energy at 5 cents per kw-hr. the operating expense will be 25 per cent less

FIG. 2—PORTABLE TRANSFORMER AND MOTOR ON GRADER BODY

than the operating expense of the steam engine, and that when interest, depreciation, insurance and taxes are taken into consideration steam-power cannot compete with electric service. The farmers who purchased this electric outfit declare themselves entirely satisfied with its operation.

Reducing Maximum Demand Created by Motor-Driven Fire Pump

Wiring rules in some cities require that service for fire-pump motors shall be entirely separate from the general-motor service, and where the "demand and energy" system of rates is in effect two maximum-demand indicators must necessarily be installed. Ordinarily the demand created by testing the fire pump at stated intervals is added to that of the general motor-service installation, increasing the monthly bill considerably. Inasmuch as this testing may be accomplished at times when motors on the general service are at rest or only partly in operation, this procedure has been considered hardly fair to the consumer, and the accompanying circuits have been worked out by Mr. Nels Joleen for customers of the Commonwealth Edison Company, Chicago.

Normally the four-pole, double-throw switch is thrown to the right, separating the two services electrically even though they are both passing through the same switch. When testing or filling is to be done, however, throwing the four-pole, double-throw switch to the left allows the fire-pump motor to operate from

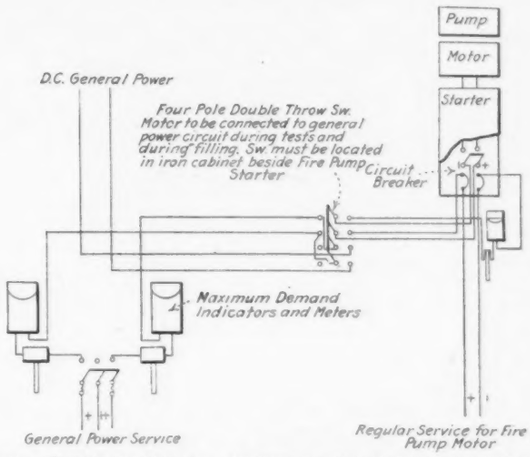

Pump
Motor
Starter
D.C. General Power
Four Pole Double Throw Sw. Motor to be connected to general power circuit during tests and during filling. Sw. must be located in iron cabinet beside Fire Pump Starter
Circuit Breaker
Maximum Demand Indicators and Meters
General Power Service
Regular Service for Fire Pump Motor

FIG. 1—DIAGRAM OF CIRCUITS FOR DIRECT-CURRENT INSTALLATION

the general motor-service circuit through the maximum-demand indicator on that circuit. It should be noted that the wiring is arranged so that if the switch is accidentally left in the open position the condition will be detected immediately by the absence of energy on the general-motor circuit.

By the use of this scheme motor-service customers are enabled to comply with the laws regarding fire pumps without incurring the excessive maximum-demand charges otherwise established. Likewise the electric-service company receives a fair rate for energy used, and should the customer operate his fire-pump

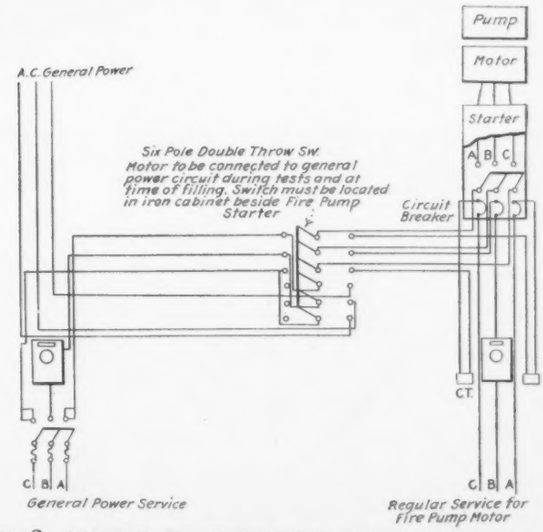

Pump
Motor
Starter
A.C. General Power
Six Pole Double Throw Sw. Motor to be connected to general power circuit during tests and at time of filling. Switch must be located in iron cabinet beside Fire Pump Starter
Circuit Breaker
C.T.
C B A
C B A
General Power Service
Regular Service for Fire Pump Motor

FIG. 2—DIAGRAM OF CIRCUITS FOR ALTERNATING-CURRENT INSTALLATION

motor when his general motor-service load is high the fact will be recorded by the demand indicators.

Where alternating-current, three-phase motors are installed a six-pole double-throw switch is required. Connections for a similar scheme using alternating current are given in Fig. 2.

Apparent Power Paradox in Making Ice-Cream by Electricity

An interesting case recently arose on the lines of the Central Illinois Public Service Company in which it was shown that as an ice-cream factory approached its rated output the specific cost of production actually increased instead of decreased. In the plant under consideration the equipment consisted of a 20-hp, three-phase motor operating at 900 r.p.m. and driving a 10-ton refrigerating machine; a 5-hp, three-phase, 1800-r.p.m. motor driving a line shaft to which three brine-cooled ice-cream freezers were connected, a 3-hp, three-phase, 1800-r.p.m. motor driving an ice crusher; a 3-hp, single-phase, 1800-r.p.m. motor driving a brine pump, and a 2-hp, single-phase, 1800-r.p.m. motor driving a fan. Taking the ice-cream company's monthly energy consumption in kilowatt-hours and its monthly output in gallons of ice-cream, Mr. H. H. Wood, district salesman for the electric-service company, plotted the curves shown in Figs. 1 and 2. Here it was revealed that the kilowatt-hours per gallon of ice-cream were less in May than in June, July or August, even though the production was much greater in each of the latter three months. The explanation of this apparent paradox, however, was found to lie in the fact that during the month of May it was unnecessary to drive the large refrigerating machine at its full rating, while in the hotter months all of the available refrigeration was needed and the 20-hp motor worked at full load.

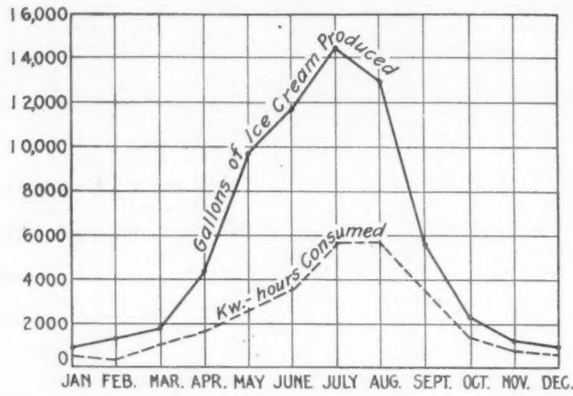


FIG. 1—CURVES OF ENERGY INPUT AND FACTORY PRODUCTION FOR TWELVE MONTHS

DATA ON ICE-CREAM FACTORY OPERATION

1913	Kw-hr.	Gallons of Ice Cream	Kw-hr. Divided by Gallons
January	598	960	0.62
February	479	1,120	0.43
March	717	1,865	0.38
April	1,575	4,287	0.37
May	2,527	9,668	0.26
June	3,560	11,812	0.30
July	5,443	14,495	0.35
August	5,452	12,954	0.42
September	3,399	5,517	0.61
October	1,343	2,117	0.63
November	756	1,212	0.62
December	648	958	0.68

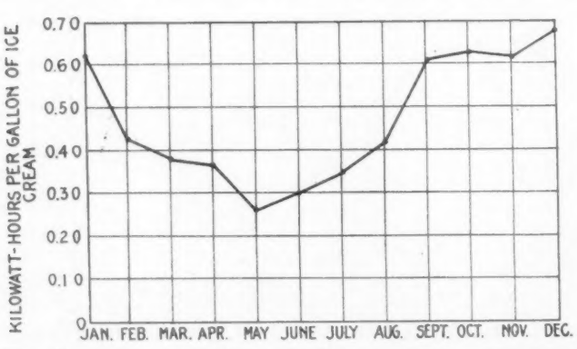


FIG. 2—CURVE SHOWING SPECIFIC ENERGY PRODUCTION FOR TWELVE MONTHS

The data in the accompanying table are also interesting as indicating what specific energy consumption may be expected in a plant of this kind operating all twelve months of the year. The column headed "Kw-hr. Divided by Gallons" shows an average of 0.39 kw-hr. per gallon of ice cream throughout the year.

An Electric Sign on the Factory Lot

On a lot adjoining the factory site of the Hartford (Conn.) Rubber Works Company an electric sign, 60 ft. long, with letters 3 ft. high, has been erected, facing an important street in the outer industrial district.

LARGE ELECTRIC SIGN ON FACTORY LOT

The sign, which is illustrated in the accompanying photograph, is carried on an angle-iron frame, with letters 10 ft. above the ground, and its illumination is provided by 213 5-watt, 12-volt lamps. Electric energy for the illumination of the sign is supplied by the Hartford Electric Light Company.

Pumping Illinois Oil Wells Electrically

After prospectors had become discouraged by unsuccessful efforts to find oil in Crawford County, Illinois, in the vicinity of the city of Robinson, one with greater persistance than the rest drilled a well on a vacant back-yard in town. The result was a producing well. More wells were then drilled in back-yards, and now eleven of these successful projects are being made to deliver up their crude black product through the agency of motor-driven pumps.

Motors rated at 3 hp, operating on three-phase, sixty-cycle, 220-volt circuits, are installed at each of these wells, for although the average pull on the pump for a 1000-ft. well is less than 3 hp, there are times when the well, becoming choked with sand, requires a motor of this size. The pumps operate from eight hours to ten hours a day and constitute a load which is very desirable from the central-station point of view both from its aggregate size and because it is in the main of an "off-peak" character.

Illumination and Wiring

Construction of 13,000-Volt Line Near Baltimore

BY J. T. KELLY, JR.

Early last year the Consolidated Gas, Electric Light & Power Company, of Baltimore, contracted to furnish service to the Maryland Steel Company at Sparrows Point near Baltimore, the original contract being for 1000 kw, with a possible ultimate growth to 9000 kw or 10,000 kw. The Maryland Steel Company, it will be remembered, built for the United States government the floating drydock *Dewey*, which was taken to Manila, P. I. In addition to its large marine department, this company also produces annually many tons of steel rails.

The relative locations of Baltimore and Sparrows Point are shown in Fig. 1, together with the route of transmission line as finally chosen. Several routes were considered but discarded in favor of the one shown, which is approximately 43,000 ft. in length.

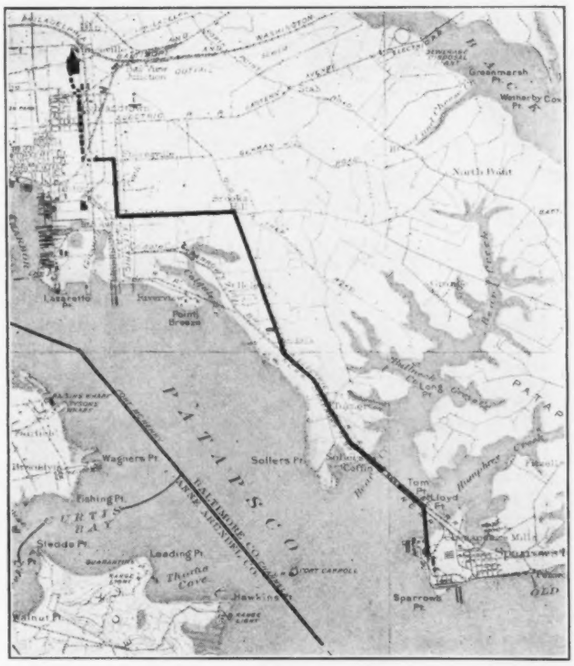


FIG. 1—LINE BETWEEN BALTIMORE AND SPARROWS POINT

The voltage used is 13,200 at twenty-five cycles. From the Highlandtown substation at the Baltimore end the first 6700 ft. of the line is underground, the rest being aerial on wood poles designed to carry four circuits, two being originally installed.

The crossing of Bear Creek, some 3600 ft. wide and a navigable stream, presented the greatest problem. To clear all shipping the wires had to be 85 ft. above high water, and there was no foundation for towers. It was therefore decided to erect poles in the water from either shore to the edges of the channel and cross the channel by means of submarine cables, each 490 ft. in length.

The company has a gas main crossing Bear Creek at this point, supported by a bridge structure. The poles were set opposite and close to bents of this structure, being erected by a pile-driver and bottomed in the mud by a few light blows on the top. They were then secured by iron bands to the bridge structure itself.

The submarine cables, each weighing with its reel over 7000 lb., were loaded on a scow at Baltimore, towed to Bear Creek, the reels set up on the scow, and the cables pulled into place by a tugboat.

Fig. 2 shows the construction described above, also the connections of the submarine cables to the line, and the lightning arresters, which are mounted in pairs

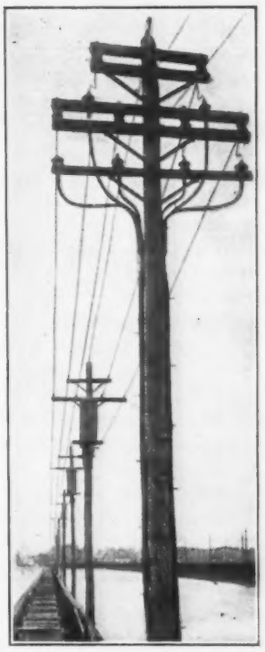


FIG. 2—LINE CROSSING BEAR CREEK

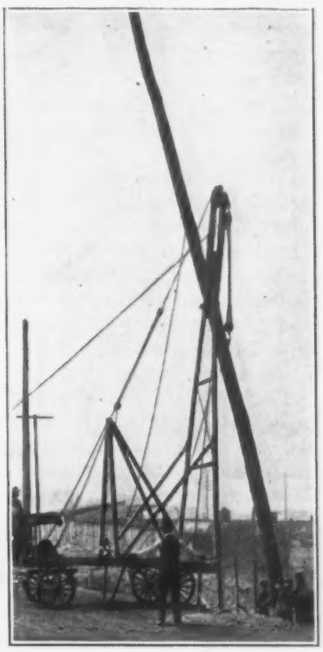


FIG. 3—DERRICK FOR ERECTING POLES

on poles adjacent to the terminus of the line. The method of dead-ending on spool-type insulators is also plainly shown. At corners in the line a method of rolling without cutting the wires was used, the pole framing being the same as shown for dead-ending, except that extra long arms were used to allow proper clearance between wires and the arms were canted to

FIG. 4—STANDARD POLE FRAMING

divide the angle in the line. Fig. 4 shows the standard pole framing.

The line is made up chiefly of 50-ft. poles and consists entirely of chestnut timber except for some thirty poles set in the bed of Bear Creek, which are of Southern

cypress, as high as 75 ft. on account of the depth of water and mud. At the crossing over the Baltimore & Sparrows Point Railway in Sparrows Point two steel towers were used, in order to meet the railroad specifications. These are 44 ft. high and 6 ft. square at the base. They were built and erected by the Maryland Steel Company.

The underground and submarine cables are No. 4/0 and are equipped with Davis open-air terminals. These are shown in Fig. 2. The cables are protected by three sets per circuit, of graded shunt lightning arresters, there being one set of three arresters at the underground pole and one set at each end of the submarine cable.

The line wires are No. 0. The ground wire is standard 5/16-in. galvanized guy strand and is grounded every fifth pole to a 12-ft. pipe driven in the ground. The line insulators were supplied by the Ohio Brass Company and the spool-type insulators also. The galvanized angle-iron cross-arm braces, shown in Figs. 2 and 4, are standard with the Consolidated company for high-tension or heavy work. The guying is done with 7/16-in. galvanized strand.

The standard pole spacing is 105 ft., and most of the poles were handled with the pole-erector wagon. Fig. 3 shows a 55-ft. pole just going into position. It will be noted that it was necessary to splice the boom on account of the unusual height of some of the poles to be handled. The Maryland Steel Company provided a brick substation of ample size and substantial design, equipped with concrete shelf bus structures in duplicate.

The load at the present time is about 2000 kw, partly alternating current handled through transformers, and partly direct current, 120-240 volts, supplied by two 400-kw rotaries. Owing to the synchronous operation of these rotaries, the power-factor of the load remains very close to unity.

Church Lighting with High-Efficiency Incandescent Lamps

BY A. L. POWELL

From an illumination standpoint the church has too often been sadly neglected. Great stress has been laid on the architectural harmony of the lighting equipment, and in some cases this has proved fatal to proper lighting. The fixtures in many instances are things of beauty by day, but, being studded by bare lamps and hung low, many light sources are in the field of view during the evening services. It is appreciated, of course, that in no instance should the architecture of the building be spoiled by the improper placing of lamps, but the designer can usually find a way to meet this requirement without the lighting scheme becoming a cause of annoyance.

Inasmuch as there are a great many kinds of church interiors, no one scheme of lighting will be universally applicable. It is well that this is so, or a monotony and commercial appearance might result. Hence it is necessary to describe an individual installation rather than to give a general discussion of the subject.

The writer has previously outlined in the technical press* the principles of good church lighting. Recently an installation was brought to his attention which is quite novel and which, by reason of its peculiar features, warrants description.

St. Mary's German Catholic Church, McKeesport, Pa., is Byzantine in treatment, consisting of a central portion with narrow side aisles. The walls are of masonry, and these, as well as the arches and clerestory, are elaborately decorated with brightly colored conventional and ecclesiastical pictures. The beamed wooden roof is light in color. The general illumination formerly in use was supplemented by the numerous combination side-wall brackets now shown unlighted. These were placed low, and hence when turned on tended to distract attention. Recently, however, there have been installed eight 1000-watt multiple tungsten lamps. These are spherical in shape and have their lower halves frosted. At the time of installation no suitable reflectors were available for use with this size of lamp, so the units were simply hung from the roof trusses by single chain fixtures.

FIG. 1—VIEW TOWARD ALTAR ST. MARY'S GERMAN CATHOLIC CHURCH, MCKEESPORT, PA.

The use of bare lamps is generally to be discouraged, but in this case the hanging height is so great (40 ft. above the floor) that the glare is not noticeable. The lamps are hung about 15 ft. below the roof and spaced on approximately 25-ft. centers. A relatively high wattage is used considering the area to be lighted, and the church is brightly illuminated, as can be judged from the night photographs reproduced herewith.

FIG. 2—LOOKING TOWARD REAR OF CHURCH LIGHTED BY EIGHT 1000-WATT TUNGSTEN LAMPS

It is true that the efficiency of downward utilization is comparatively low, but it was quite essential to use a unit giving a wide spreading of the light upward and to

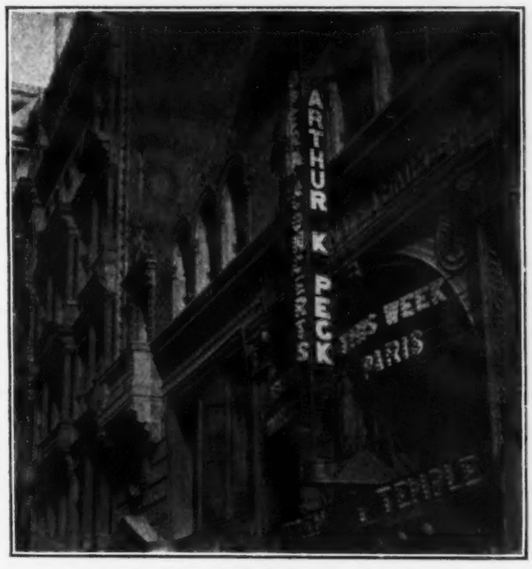
*General Electric Review, February, 1914.

the sides, to illuminate the elaborate decorations. A reflector which had a tendency to concentrate the light would have been absolutely inapplicable. The balance is well preserved, and the lamps are so placed that the eye is not seriously fatigued.

Thus the present installation shows that sometimes a lighting unit which on first thought is quite inappropriate may be satisfactorily applied and may actually meet conditions.

A Revolving Four-Sided Electric Sign

Tremont Temple, Boston, makes use of the electric signs shown in the accompanying halftone in advertising lectures and moving-picture entertainments in its auditorium and smaller halls. The most interesting of these signs is a vertical four-sided steel-frame structure about 25 ft. high, which is arranged to revolve about twice a minute, the drive being by a ¼-hp, 110-volt motor located in a box opposite the lower bearing. The letters measure approximately 10 in. square and contain about ten 10-watt tungsten lamps each. By using all four sides of the sign for display lettering the passer-by



A REVOLVING FOUR-SIDED ELECTRIC SIGN

can easily be informed of coming attractions for several days ahead, the rotating feature being decidedly effective in this class of service.

RECENT TELEPHONE PATENTS

New Apparatus

Telephone wall instruments are usually fastened in position by means of screws. Mr. J. A. Douglas, of Waterloo, Ia., has devised a method of hanging the wall set on hooks so that it may be removed easily. A flexible electrical connector between the line wires and the telephone instrument is provided. The telephone instrument is equipped with an upward-projecting block which carries a conductor on each face. The line wires terminate upon two conducting arms which are so mounted that their free ends are forced together by springs. These ends are cut with a V-shaped opening into which the telephone-connected block slips, thus driving the arms apart and riding them upon the conducting plates.

Selective Systems

A circuit system has been patented by Mr. O. A. Daniels, of New York City, the patent having been assigned to the Western Electric Company. Two keys, each with two positions, may be made to control six or more different current sources. This is effected by the use of polarized relays in turn controlling other relays. Two oppositely poled polarized relays are associated with each side of the line. The keys cause these relays to operate in combinations so that their contacts control six sets of local circuits, one at a time.

A patent granted jointly to Messrs. P. Lavery and W. E. Brandlow covers a lockout system designed to prevent a third party on a line from interrupting or listening to a conversation. A control magnet of the interfering instrument receives sufficient current, if two instruments are already connected, to block the switch springs.

Letters to the Editors

Reversed-Polarity Correction

To the Editors of the Electrical World:

SIRS:—In replying to a question asking how to correct the polarity reversal of a generator, in your issue of Aug. 1, page 237, it is suggested that in the case of a shunt machine wires be extended to it from some other generator. This is seldom necessary, as accidental reversals are usually caused by some other generator or battery with which the machine in question has been running. With the bus alive and the generator armature at rest, one may raise the positive or the negative brushes all around the commutator or insulate them from it with pasteboard or paper, and then close the main switch for a moment. With the armature circuit open in this way the shunt-field circuit receives current from the bus in the proper direction to build up the machine with the correct polarity. This applies of course to shunt and compound machines alike and is used on compound generators having three-pole switches. It eliminates all wiring changes and one does not need to know the polarity of the field circuit.

Golden, Col. WILLIAM J. HAZARD.

Rubber-Insulation Specifications

To the Editors of the Electrical World:

SIRS:—It has come to my attention that certain manufacturers are attempting to discredit the specification and analytical procedure for rubber compound issued in the preliminary report of the joint rubber insulation committee, which was outlined on page 133 of your issue dated Jan. 17, 1914.

The method adopted is to send to those using the specification a reprint of the report of the analytical committee of the American Chemical Society on the procedure of the joint rubber-insulation committee. This reprint is not accompanied by the reply of the joint rubber-insulation committee, which appeared in the same issue of the *Journal of Industrial and Engineering Chemistry* (Vol. VI, No. 6, p. 155, June, 1914).

This reply shows that the report which was made by the analytical committee of the American Chemical Society is defective in that the procedure criticised was not properly followed by the members of that committee in the tests upon which their report is based. Engineers who receive copies of the Chemical Society report are therefore requested to read likewise the above-mentioned reply. WM. A. DELMAR,

Secretary Joint Rubber Insulation Committee.

New York, N. Y.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Efficient Method of Providing Back-Pressure Valves with Drips

Fig. 1 shows the piping at a feed-water heater which was so arranged that the back-pressure valve would not relieve the pressure. To relieve air binding in the heater, a 2-in. vent was connected into the 6-in. exhaust

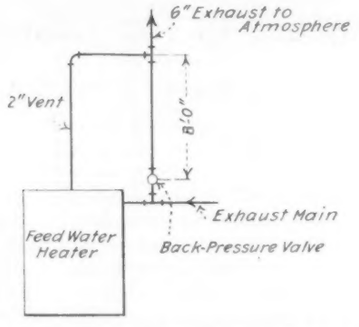


FIG. 1—PIPING TO FEED-WATER HEATER

to atmosphere above the back-pressure valve. This valve was, however, not dripped. Consequently a static head of about 3.5 lb. formed above the seat of this valve and prevented it from opening, as the pressure in the heater was never above 2.5 lb.

Trouble was experienced with two other back-pressure valves at other points in this same plant, owing to the lack of drips at these valves. The steam leaking past these valves, when closed, condensed and formed a static head. When this reached a height equivalent in pounds to the pressure carried it could rise no higher as it was then balanced by this pressure. The objection to this condition, however, was that the water standing above the valve corroded the valve parts, thus causing them to stick. One remedy for this condition is to drill a couple of holes through the valve seat, thus allowing the water to drain back. The steam escaping through these holes (say 2.25 in. in diameter) would

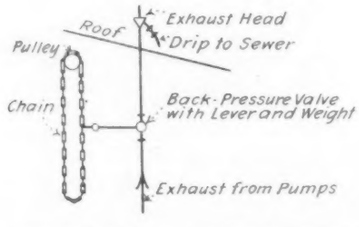


FIG. 2—CHAIN-OPERATED BACK-PRESSURE VALVE

be slight. Another remedy would have been the provision of drips on the valves.

Both of the above methods would have been more expensive to carry out than the arrangement shown in Fig. 2. By operating the chain a few times each day the valve is opened and the condensation drained back, thus keeping the valve parts in better condition.

Some Safety Rules in St. Louis

Mr. H. Spoehrer, secretary of the central safety committee of the Union Electric Light & Power Company, of St. Louis, has promulgated additional safety rules as follows:

Railings are to be erected where, on the company's properties, preventive measures are necessary to keep pedestrians from stepping on railroad tracks.

Picket doors are being installed at stations so that solid wood doors may be left open in warm weather without possible danger to public.

Switchboard guards are to be erected wherever such construction is of advantage from the standpoint of safety.

Walkways on cranes and other apparatus are to be equipped with railings wherever needed.

Trucks are to be provided with boxes to contain about ten rubber blankets, which are to be thus carried in order to prevent wear due to their rubbing against ladders, etc.

Pole ladders are to be equipped with chain at the top so that ladder rests firmly against pole to lessen danger from the ladder turning when it is subjected to weight.

All trucks are to be subjected to a rigid inspection nightly, which is to cover all vulnerable parts such as brakes, locknuts on wheels, drive chains, etc. Brake locks, in particular, are to be kept under strict inspection and shall not be used when condition is questionable.

Where dummy elevators are in use a safety latch shall be installed to be operated in conjunction with bell signal to preclude possibility of accidents to the arms or heads of persons working around them.

Electric Heater for Maintaining Heat Balance During Refrigeration Tests

An electric heater is employed in connection with the experimental refrigerating plant at the University of Michigan, Ann Arbor, Mich., for maintaining a heat balance while refrigerating tests are being conducted on the apparatus. By compelling the brine to circulate through a heat-insulated closed circuit consisting of the brine cooler, electric heater and brine pump it is possible, without the introduction of much error, to assume that the electrical energy heat input to the heater is equal to the heat energy absorbed by the brine. When the refrigerating apparatus is operating at full rating, which is 13 tons of refrigeration per twenty-four hours, more than 155,000 lb.-Fahr. heat units must be supplied by the heater per hour. To provide for overload tests the heater is designed to dissipate as much as 204,720 lb.-Fahr. units per hour. Six heating elements are employed each requiring 10 kw at 220 volts. Each unit consists of 50 ft. of No. 32 B. & S. gage nichrome resistance ribbon, 0.75 in. wide, wound around a strip of transite (asbestos wood) and inclosed in a galvanized sheet-iron brine-excluding case. Heavy copper terminals are attached to the ends of each resistance unit for connection to the energizing circuit.

A Thermocouple Electrical Generator

A method of generating electricity on a commercial scale by thermo-electric couples has been devised by Mr. Johannes Marschall, of Dresden, Germany. The apparatus appears relatively simple and inexpensive to install, and will, it is declared, produce energy at considerably less expense than any other system now used.

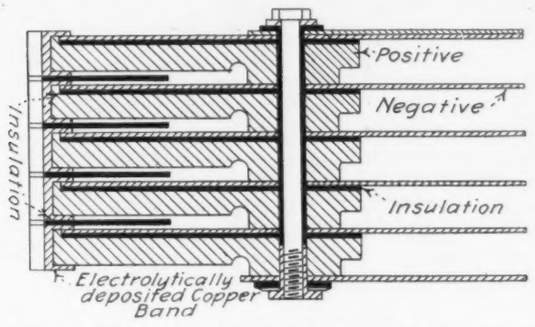


FIG. 1—SECTION THROUGH THERMO-ELECTRIC UNIT

In general, the apparatus consists of connected thermo-electric couples arranged around and touching the periphery of flues carrying heated gases. The unheated ends of the couples are cooled by circulating cold air around them. The furnace employed in heating the couples may be designed to burn coal, lignite or oil, and may be equipped with automatic firing devices controlled by the current flowing through the couples. The system has been developed, it is said, especially for installations in private houses, office buildings, isolated plants, etc., but may be extended to meet the requirements of central-station use.

Tests on the apparatus conducted by Dr. Kollert, professor in the technical schools at Chemnitz, Germany, are said to show that, with a temperature of 369 deg. C. at the hot junction of the couples and 56 deg. C. at the cold ends (making a difference of 313 deg.), the open-circuit emf produced in a single couple was 0.077 volt. With 28.2 amp flowing the working pressure was reduced to 0.0412 volt.

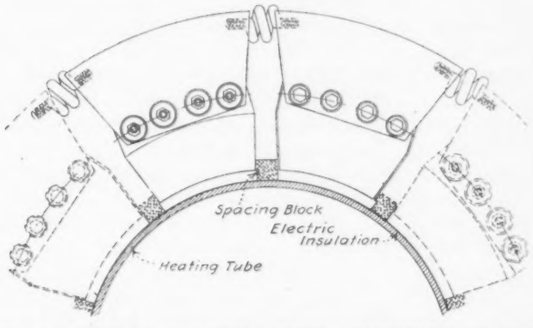


FIG. 2—THERMO-ELECTRIC UNITS ASSEMBLED ON TUBE

The couples consist of two elements, one a casting made of special alloy the composition of which is kept secret, the other a plate of copper-nickel alloy. The two elements are separated by a sheet of mica or asbestos and at the place where the heat is applied are joined by an electrolytically deposited band of copper. Five of these couples are connected rigidly together in series, forming a unit. Ten of these wedge-shaped units are made into rings and clamped around the heating tubes as shown. In the apparatus developed by Mr. Marschall sixteen rings were employed, making a total of 800 couples. The rings may be connected in parallel, series or parallel-series to obtain the desired voltage. A sheet of insulation is interposed between the heating tube and the hot contacts of the couples to prevent the elements being short-circuited. The air emerging from the cooling case may be utilized for heating the building in which the apparatus is installed.

According to experiments which have been conducted with this apparatus, about 5.5 lb. of lignite must be consumed per kilowatt-hour of energy produced. Assuming that lignite costs about $2.40 a ton, the fuel cost of producing the energy was about 0.66 cent per kw-hr.

The cost of installing a thermo-electric generating equipment as compared with steam, gas and petroleum-engine-driven plants of the same rating is declared to be in the ratio 13:26:30:38 respectively. The cost of producing energy in the same plants is stated to be in the ratio of 5.6:24.0:16.5:19.3 respectively. The latter figures, it is explained, do not take into account the depreciation or attendance expense in the steam, gas and petroleum-engine-driven plants.

Pulling Underground Cables in St. Louis

Supplying St. Louis with energy from the hydro-electric generating station at Keokuk necessitated tying the existing feeders of the Union Electric Light & Power Company to the 60,000-kw substation which

FIG. 1—DRAWING-IN WIRE READY FOR WORK

distributes the energy at St. Louis. The point at which the two systems are tied together is on the opposite side of the city from the main distributing substations, and the most modern methods were used to pull the underground cable through the conduits between these points.

The Union Electric Light & Power Company arranged the motors on its electric trucks so that they could be utilized in pulling the cables through the conduits. The adaptation of truck motors to this work, while not entirely new, is interesting in this case because of the ease with which the drive can be transposed from the truck wheels to the cable-pulling drum. The drum is supported above the motor on two rocker

arms the common axis of which is not concentric with the axis of the drum. The drum is connected to the motor by a chain drive. When it is desired to convert the truck into a cable-pulling machine pins in the driving chains connecting the motor with the truck wheels are taken out and the chains taken off. The chain which is used to drive the cable drum hangs on the drum sprocket, as shown in the diagram, Fig. 4, when the car is in motion, and by turning the eccentric which supports the drum the chain is made to engage with the motor pinion. Blocks are placed under the rear wheels of the truck to assist the brakes in preventing motion of the truck when the cable is being pulled, as shown in Fig. 2. This illustration and the one in Fig. 3 show the men placing the drag line over the pulley above the cableway manhole.

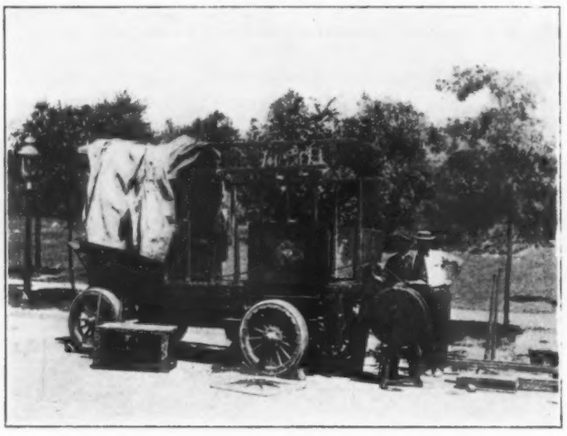


FIG. 2—ELECTRIC TRUCK FOR CABLE PULLING

After the drag line is threaded through the conduits in which the cable is to be placed, the men prepare the cable for pulling. This operation consists of slipping a special lubricating funnel over the end of the cable and fastening the drawing-in wire grip to the cable end. Fig. 1 shows the men accomplishing this work and shows the cable ready for pulling. As the cable is being pulled through the conduits, oil is poured into the funnel shown on the cable in front of the man in Fig. 4.

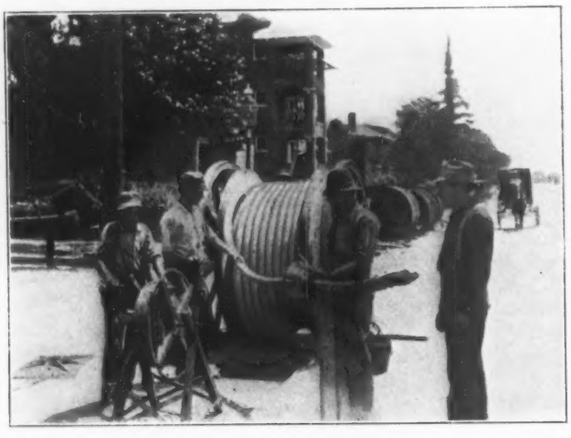


FIG. 3—CABLE END EQUIPPED WITH DRAWING-IN CLAMP AND GREASE CAN

This lubrication serves to reduce the tension on the drawing-in wire and reduces the chances of the cable being bruised while it is being pulled through the conduit. The cables are all treated with a special fireproofing material after they are installed and are tested for grounds to cable sheath for crosses and for continuity. From 4000 ft. to 7000 ft. of cable a day can be pulled in by this method, depending on the frequency of the manholes. This amount of cable represents a maximum of about fifteen reels a day. It is asserted that none of the cable which has been put in has been found faulty on account of the method of installing.

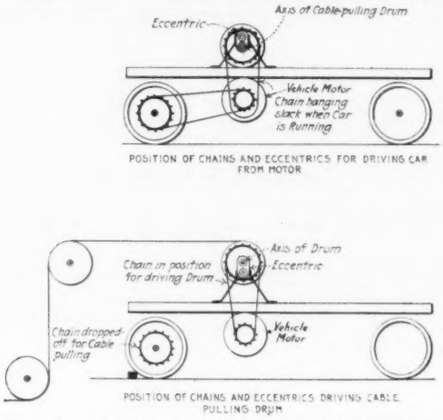

Eccentric
Axis of Cable-pulling Drum
Vehicle Motor
Chain hanging slack when Car is Running
POSITION OF CHAINS AND ECCENTRICS FOR DRIVING CAR FROM MOTOR
Chain in position for driving Drum
Axis of Drum
Eccentric
Chain dropped off for Cable pulling
Vehicle Motor
POSITION OF CHAINS AND ECCENTRICS DRIVING CABLE PULLING DRUM

FIG. 4—DIAGRAM OF TRUCK ARRANGEMENT

Removing Water from Power Cable

Water in an 11,000-volt submarine cable at San Francisco was removed recently by means of a hand vacuum pump which was attached successively to the ends of each of the three conductors at the point where water had entered the cable through a splice. The pump was used when the cable had been raised for repairs. It was found that a 26-in. vacuum was effective in removing water from lengths of cable up to 30 ft.

Arcing at Direct-Current Contacts

What factors influence arcing when a low-potential direct-current circuit is broken? W. H. P.

The duration of an arc formed on breaking a direct-current circuit carrying a load depends on the heat developed and the electrodynamic and magnetic influence caused by the passage of the current through the arc. Electrostatic forces may also tend to maintain an arc. So-called "non-arcing" metals are not effective when used on direct-current switch contacts because too long a time is required for the formation of sufficient oxide to extinguish the arc. The size of the electrode has very little effect on the length of the arc, but sharp edges near the contact points tend to produce and maintain a "flash-over." This is especially true with inclosed switches as the contacts are inherently subjected to an ionized atmosphere during the interruption of the circuit. Unless there is a heavy inductive load in circuit with a direct-current switch it is advisable to provide for as rapid separation of the contacts as possible. In ordinary cases quick opening of a switch will prevent the collection of ionized gases and minimize the deterioration of the contacts. This result is probably attributable to the fact that the surrounding temperature is not allowed to rise abnormally, and hence the air is not ionized enough to maintain an arc. It is only on circuits carrying about 60 amp or less that rapid breaks are effective in extinguishing arcs. With large switches designed to interrupt currents in the vicinity of 100 amp the arc may be extinguished by deflecting and breaking the arc by magnetic attraction.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Calculation of Tooth Induction in Dynamo Armatures.—F. BLANC.—The author has formerly described a graphical method for determining the true tooth induction in slotted armatures and has applied his method to two special cases, the first being that of slots with parallel sides and the second that of slots with radial sides. He now applies it to a third example, namely the case in which the sides of the tooth are parallel.—*Elek. Zeit.*, July 23, 1914.

Lamps and Lighting

Arc-Lamp Electrodes.—A note on a recent British patent of the British Thomson-Houston Company and the General Electric Company of this country (No. 18,355, 1913.) The invention consists in employing a lithium compound such as borate, fluoride, or oxide as a steadying material in white arc-lamp electrodes. In the case of titaniferous electrodes it is found that the addition of the lithium compound increases the intensity of the light produced, so that the invention also includes the addition of a lithium salt to such electrodes as an intensifying agent even if other steadying materials are also present. A satisfactory electrode has been made by mixing 96 per cent of finely powdered titanium carbide with 3 per cent of black copper oxide and 1 per cent of lithium fluoride in a thin iron tube.—London *Elec. Eng'ing*, July 30, 1914.

Electric Stairway Lighting.—ARTHUR VON ALKIER.—An illustrated article on automatic clocks which switch the lamps of stairway-lighting systems in and out at regular hours.—*Elek. Anz.*, May 21, 28 and June 7, 1914. A lighting calendar showing the proper hours for switching in and out the lamps in different German cities at different periods of the year is given in *Elek. Anz.*, June 14, 1914.

Electric Train Lighting.—MAURICE D'ASTE.—The first part of an article in which the author deals with the electric-lighting equipment of railway trains and shows how to determine the maximum capacity of generator and storage batteries required for service. The article is to be continued.—*La Lumière Elec.*, June 27, 1914.

Traction

Brazil.—H. M. SAYERS.—A paper read before the Newcastle Congress of the (British) Tramways and Light Railways Association. The author details the conditions and difficulties under which street-railway construction is carried out in Brazil, special reference being made to experience gained in the neighborhood of Santos. He deals with the problems of labor, legislation, track construction, overhead work, car erection, parcel haulage and passenger traffic. A special method of packing new cars for shipment by steamer is described.—London *Electrician*, July 24, 1914.

Newcastle.—RICHARD MAYNE.—A paper read before the (British) Tramways and Light Railways Association describing some features of the municipal electric-railway system of Newcastle, especially the spreading out of the lines, carrying of great numbers of workingmen at low fares and receipts gained by the haulage of acceptable parcels. About three years ago it was realized that on the outward journey on most of the routes the cars began to unload in the last three-quarter mile, and after a census was taken as to the number of 2-cent fares paid in that part of the journey a system of 1-cent fares for the last half mile was instituted. This proved very successful.—London *Electrician*, July 24, 1914.

Town Planning in Relation to Street Railways.—J. A. BRODIE.—A paper read before the (British) Tramways and Light Railways Association. In the first part of his paper the author discusses how railways affect and are likely to be affected by the various schemes of improved town planning which may be carried out in the near future. He gives some account of what is being done in Liverpool in this direction, together with details of the arrangement of the railway lines on new roads. Finally he details certain improvements which he considers necessary if the prosperous future of electric railways is to be assured.—London *Electrician*, July 24, 1914.

Rail Joints.—R. HUMPHRIES.—An abstract of a paper read before the (British) Tramways and Light Railways Association. The author is in favor of welded joints with fishplates. The use of electric arc welding for welding on the fishplates is described. An account of the discussion is also given.—London *Electrician*, July 24, 1914.

Rail Sections.—FRED BLAND.—An illustrated paper presented before the Newcastle Congress of the (British) Tramways and Light Railways Association on standard tramway rails. The author compares English rail sections with sections used in other countries.—London *Electrician*, July 24, 1914.

Installations, Systems and Appliances

Rates for Electricity in Different Countries.—G. SIEGEL.—The conclusion of his long statistical article in which the author reviews the rates in use in different countries for charging for electrical energy. In Holland the simple meter rate is prevalent. The usual charges per kw-hr. are 8.5 and 10.5 cents for lighting and 4 and 6 cents for motor service. Discounts are often allowed. In the summer resort Zandvort temporary residents have to pay 25 cents per kw-hr. for lighting and the inhabitants 10.5 cents. In England the flat rate is rarely used, but meter rates are employed with greatly varying modifications. Both the Wright tariff and the telephone system are based on the principle that the fixed charges should be primarily considered in the development of the rate schedule. In Sweden, though water-powers are used to a large extent, flat rates are rarely offered. The usual system is a simple meter scale without much complication. The article closes with a brief review of the different tariffs in use in the United States.—*Elek. Zeit.*, July 23, 1914.

London's Electricity Supply.—The supply committee of the London County Council has made what is called an unexpected proposal for the future of London's electricity supply. It proposes that the three classes of electricity undertakings—viz., the fourteen companies which are purchasable on cheap terms by the London County Council in 1931, the fifteen undertakings which

the borough councils can retain in perpetuity under the present law, and the various neighboring company and municipal undertakings outside of the County of London—should all be acquired by a new controlling authority and combined. It further proposes that the new undertakings thus formed be leased to a company which is to provide part of the capital required for extensions, and this capital will apparently rank, so far as payment of interest and dividends are concerned, after only that provided by the controlling authority. The leasing company is to work under the general control of this authority under certain definite restrictions, including the limitation of dividends.—London *Elec. Eng'ing*, July 30, 1914.

Starting Rheostats.—L. CACHOT.—Two profusely illustrated articles describing starting and regulating rheostats for direct-current motors.—*La Revue Elec.*, May 1 and June 5, 1914.

Electricity Supply in Paris.—E. IMBS.—After a historical sketch of the development of electricity supply in Paris prior to 1907, and an outline of the combination of the different "sectors" into a single supply system, a rather detailed description is given of the distribution network and of the two new generating plants in the north and the southeast of Paris.—*La Lumière Elec.*, June 13, 1914.

Electrophysics and Magnetism

Direct-Current Brush Discharge.—STANLEY P. FARWELL.—When there exists a large difference of potential between a wire and a neighboring conductor such as a similar and parallel wire or a coaxial cylinder the discharge phenomenon known as corona is likely to occur. The writer has been studying the corona as produced by continuous potentials for wires from 0.037 mm to 1.285 mm in diameter and tubes 3.50 cm and 4.45 cm in diameter. The relation between difference of potential and current flowing in the wire or tube has been studied for atmospheric pressure for the different sizes of wire; the critical voltage for visual corona has been obtained for pressures from somewhat above atmospheric down to 2 mm of mercury and the character of the discharge noted, and the effect of variation of voltage for a constant low pressure has been investigated. The object of the present paper is to present some of the phenomena observed at these lower pressures, the influence of a short arc in series with the apparatus upon the character of the discharge, and the increase of pressure in the tube due to the ionization.—*Phys. Review*, July, 1914.

Magneto-Optics.—R. W. WOOD AND G. RIBAUD.—An account of an experimental investigation of the magneto-optics of iodine vapor. Up to the present the magnetic rotations of the plane of polarization in the vicinity of absorption bands may be divided into two classes. First, anomalous rotations, in which the sign changes in crossing the band, as observed by Cotton for certain solutions and by one of the present authors for a solid film of a neodymium salt. Rotations of this nature appear to obtain in cases in which there is no change in the position of the band of absorption, but merely an alteration in velocities of right-handed and left-handed circular vibrations. Second, rotations in which the sign is the same on opposite sides of the absorption band, as at the D lines of sodium and the iodine lines. Rotations of this type are explained by the division of the line into a Zeeman doublet by the magnetic field. It seems probable, therefore, that there is a small Zeeman effect for the iodine, but it is doubtful if it can ever be detected as it is of the order of magnitude of the width of the lines, probably much less in fact. The study of the magnetic rotation of the vapor of sodium by the improved methods outlined in the present paper will undoubtedly give much more satisfactory results.—*Philos. Mag.*, June, 1914.

Telegraphy, Telephony and Signals

New System of Wireless Telephony.—LUDWIG KÜHN.—An illustrated description of a new system of wireless telephony, based on a kind of electric relay action so that apparently any amount of antenna energy can be

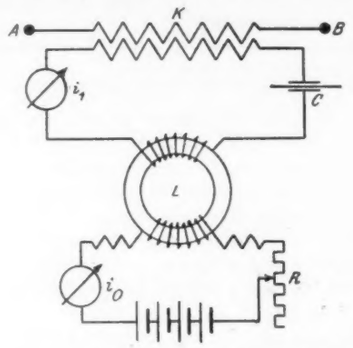


FIG. 1—PRINCIPLE OF ARRANGEMENT

utilized with this system. Experiments with this system have been successful over distances up to 600 km (360 miles). If a coil is wound around a closed iron core and direct current is passed through the coil, the self-inductance is a function of the permeability and therefore also of the magnetizing current. If such a self-inductance is placed in an alternating-current system which is supplied with electric oscillation energy from a coupling transformer K (Fig. 1), it is possible to adjust the rheostat R and, therefore, the direct current i_0 in such a way as to bring the alternating-current i_1 circuit into resonance. Reversely, if resonance is established, a change on the direct current i_0 will destroy the resonance and this will manifest itself by a decrease of the alternating current i_1. A further step by which the resonance capability of the system can be increased is shown in Fig. 2, where A is a high-frequency generator of constant period, M a condenser, B the coupling transformer with closed iron core, C the antenna, D two induction coils to choke off the high-frequency currents from the auxiliary direct-current circuit, and E a third winding on core B. The generator A furnishes high-frequency current of constant wave-length. If the whole system is tuned to this wave-length, the direct current in the E circuit may be i_0 and the current i_{II} in the antenna circuit may be i_{II_0}. If now the direct current i_0 in the E circuit is in-

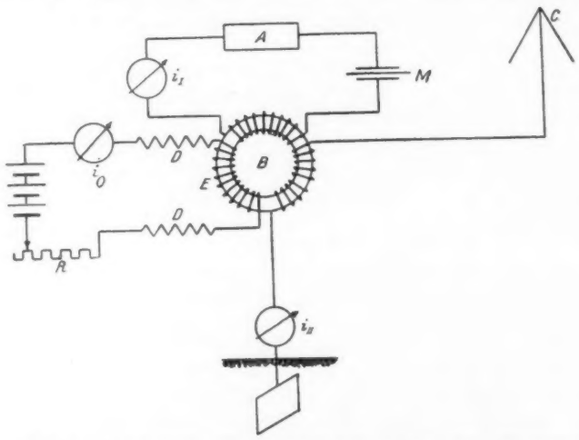


FIG. 2—ARRANGEMENT WITH INCREASED RESONANCE CAPABILITY

creased or decreased by varying the rheostat R, the current i_{II} in the antenna will decrease, since the value i_{II_0} for the resonance condition is a maximum. By plotting the values of the direct current i_0 as abscissas and the values of the antenna current i_{II} as ordinates, the curve shown in Fig. 3 is obtained. This is called a resonance curve, and is discussed by the author at con-

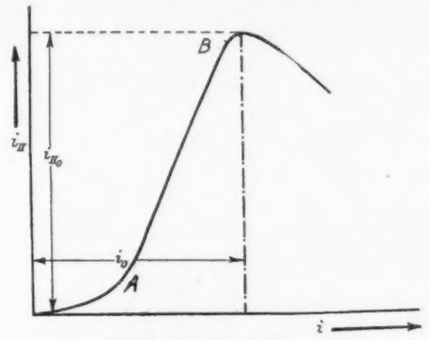


FIG. 3—RESONANCE CURVE

siderable length. The system is being worked between the points A and B of the resonance curve, since in this range the differential quotient di_{II}/di_0 has a large and constant value. The largeness of the differential quotient (the steepness of the curve) determines the efficiency of the system, while the constancy of the differential quotient determines the clearness of the sound reproduction. The final arrangement of the whole system is shown in Fig. 4, in which A is the high-frequency generator, B the high-frequency transformer and C the antenna. D_1 and D_2 are coils choking off the high-frequency current from the fundamental direct-current circuit E while F is the "sound-current circuit." The condenser G protects the sound-current transformer H against high frequency. M is the microphones, J the condensers, K the stabilizing resistances, and L is a source of direct current. D_3 is an induction coil which

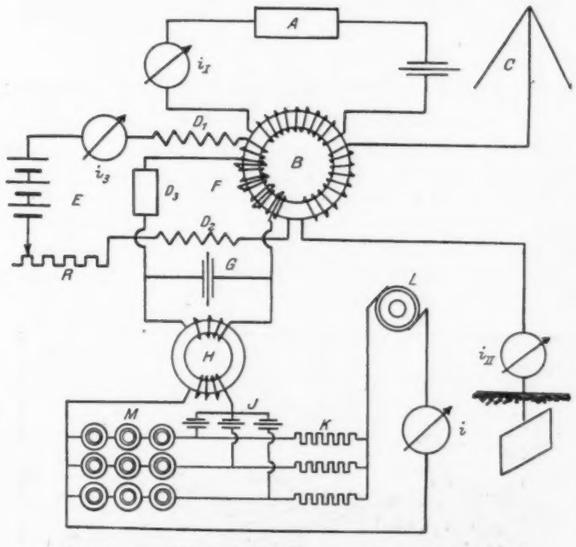


FIG. 4—FINAL ARRANGEMENT OF SYSTEM

chokes off the high-frequency from the sound-current circuit.—*Elek. Zeit.*, July 16, 1914.

Wireless Telegraphy.—Diagrams of wave trains and resonance curves obtained with the Helsby system of wireless telegraphy and some comparisons with the Marconi radiotelegraphic system.—London *Electrician*, July 24, 1914.

Miscellaneous

Electrical Purification of Milk.—An abstract of a report by J. M. Beattie on a new system of electric treatment of milk now in use at the municipal milk depot in Liverpool. A rapidly alternating current is used with the addition of salt. By this means the bacterial content of the milk can be reduced to a minimum, while the chemical constitution of the milk is apparently unimpaired. The current used is slightly over 2 amp at about 4000 volts and no undue heating effect is produced.—London *Elec. Eng'ing*, July 30, 1914.

Book Reviews

A PRACTICAL TREATISE ON SUBAQUEOUS FOUNDATIONS. By Charles Evan Fowler. New York: John Wiley & Sons, Inc. 814 pages, 477 illus. Price, $7.50.

As a result of the author's wide experience, this work will readily commend itself to the engineering profession. The treatise is not a primer nor is it a college textbook, but the author's style is reasonably explanatory. The third edition is greatly augmented and revised, as compared with former editions, and the book is now quite up-to-date with present practice. Each type of construction in subaqueous structures—cribs, piling, metal construction, caissons, pumping and dredging, transportation, piers, retaining walls, foundations generally and those for piers, docks, dams, walls, locks, etc.—is discussed in detail. These discussions are further amplified by extensive illustrations and descriptions of actual operations widely scattered over the United States and to a limited extent over foreign countries. Chapter XXVI, on concrete, gives some valuable tables in the proportioning of this material, and the chapter dealing with the cost of operations is well developed. Several appendixes provide examples of specifications that were adopted in the erection of actual structures.

MATHEMATICS FOR THE PRACTICAL ENGINEER. By Charles H. Bromley and Henry R. Cobleigh. New York: McGraw-Hill Book Company, Inc. 220 pages, 75 illus. Price, $2.

This book, which is composed largely of lessons from the engineers' study course printed in *Power*, is the result of a sincere effort to give the power-plant engineer the mathematical training that he needs in working out the problems of his daily routine. It presupposes that he is able to perform the fundamental operations of addition, subtraction, multiplication and division. From this it leads him through fractions, decimals, percentage, denominate numbers, powers and roots, ratio and proportion, formulas, mensuration, logarithms and trigonometry. For the greater part, the book covers the ground satisfactorily and well, but the chapter on trigonometry is too extended. It is safe to say that all ordinary problems can be solved by the aid of a table of sines, cosines and tangents; hence the statement of the value of each function in terms of the others, the signs of the functions in the different quadrants, and the functions of the sum and difference of angles are matters for which the operating engineer will find no application. The examples illustrating the application of the rules are appropriately chosen. As a whole the book is full of information of value to the engineer who is seeking a wider mathematical training; and, as he is his own teacher, he is at liberty to skip such parts as do not seem to have any immediate application in his work.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Indicating Fuse Plug

An indicating fuse plug rated at 125 volts is being made by the Premier Electrical Manufacturing Company, Bridgeport, Conn. The device is a two-piece plug with a brass shell and is designed for standard cutouts and entrance switches. It is equipped with a phosphor-

FIGS. 1 AND 2—FUSE PLUGS BEFORE BLOWING AND AFTER BLOWING

bronze spring and a fiber piston to which a pin is attached. In case of blow-out or short-circuit the spring is released, forcing out the piston. The pin then protrudes about 0.25 in., indicating the fact that the plug has blown. In the accompanying illustrations, Fig. 1 shows the plug before and Fig. 2 after blowing.

Counting Paper Money by Electricity

An electrically operated machine for counting paper money while it is being sorted was demonstrated last week at Gimbel Brothers', New York City, by a representative of the Buckley Bill-Counting Machine Company, Washington, D. C. As the bills are sorted on the machine table they are drawn between metal rolls which actuate counters and simultaneously feed the bills into compartments where they are stacked. If two bills which stick together are accidentally fed into the same rolls the entire machine will lock until one of the bills is pulled out. Folded single bills, on the contrary, pass through the rolls readily. Bills may be fed into the rolls at any angle, being automatically straightened out by the time that they reach the stacking compartment.

Each set of money-feeding rolls is connected in series with the magnet operating its respective counter so that separation of the rolls will de-energize the magnet, thereby advancing the counter one step. At the same time folding gates swing together to support the bill horizontally as it emerges from the rolls. As the rolls come in contact again the counter is set for the next movement and the gate is released, allowing the bill to fall squarely on those in the compartment beneath it. Each counter can be set to stack the bills in quantities of twenty-five, fifty or 100 as desired. If the rolls are separated more than the thickness of a bill, a contact is closed causing an electromagnetic brake to stop the machine after one-half the bill has passed through. So timed, the brake will not prevent a folded or wrinkled bill passing through. The compartments are arranged so that the last-counted money is separated from that previously counted until the count is checked. These machines can be built up in any number of sections, depending on the assortments desired.

Skeleton Transformer Bell

Skeleton transformer bells in 8-in. and 10-in. sizes have recently been put on the market by the Empire Transformer Company, 2723 North Clark Street, Chicago. Features distinctive of these bells are the use of laminated cores to prevent lag from residual mag-

SKELETON TRANSFORMER SIGNAL BELL

netism and the adoption of what is known as a "hammer break" at the vibrator, which gives a long and powerful stroke. With the primary winding of the bell connected to either a 110-volt or a 220-volt circuit the secondary can be operated at either 14 volts or 20 volts, giving high efficiency on alternating-current circuits of any commercial frequency. The bells are designed for use as signals for mines, schools, factories, public buildings and fire-alarm systems.

Motor-Driven Rolling Mills for Steel, Brass, Copper and Precious Metals

The accompanying illustrations represent a 90-hp cold-rolling steel mill and a 3.5-hp jeweler's rolling mill for brass, copper or precious metals. The large mill, which is driven through a triple train of gears, is equipped with ball bearings which make the energy consumption considerably less than with journal bearings. The housing rolls are 11 in. in diameter, while

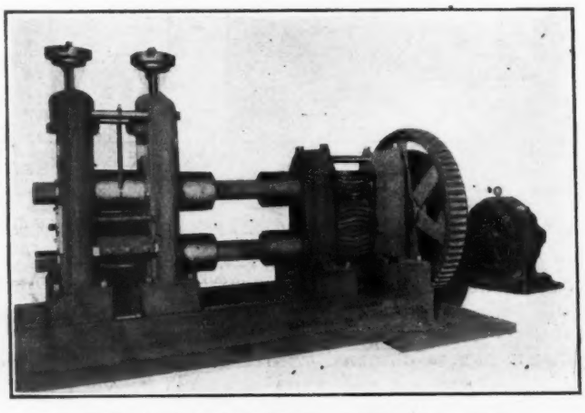


FIG. 1—MOTOR-DRIVEN COLD-ROLL MILL

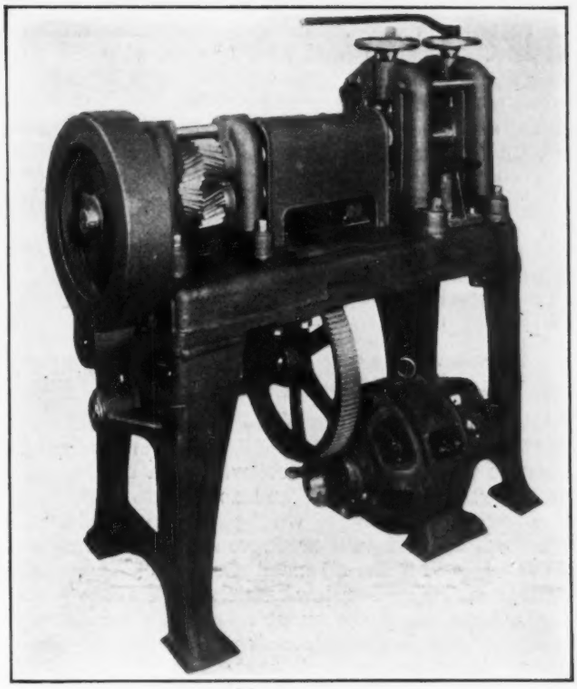


FIG. 2—JEWELER'S MILL WITH INDIVIDUAL DRIVE

the intermediate roll is 5 in. in diameter. Their faces are 5 in. wide. The small mill is equipped with a micrometer adjustment for setting the rolls for accurate work. With the motor installed as shown, the entire outfit occupies no more floor space than the mill alone, an advantage achieved through individual drive. Both of these mills are provided with controllers for varying the speed of the motor, between half and full speed. The mills were manufactured by the Standard Machinery Company, Providence, R. I., and the motors were furnished by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

A Single-Lamp Advertising Sign

An evenly lighted electric sign 36 in. long for which a single 60-watt tungsten lamp is the only source of illumination is being manufactured by the Advertogram Company, 706 Hearst Building, Chicago, Ill. A perforated metal reflector 4.5 in. long, coated with aluminum paint, interposed between the light source and the interior letter face, distributes the light evenly over the face of the sign, the letters at the ends of the sign being equally bright with those directly in front of the lamp. The company also holds patents on the changeable-letter feature, the letters themselves being made of a blue material baked on a clear glass and backed by an inner white opal glass.

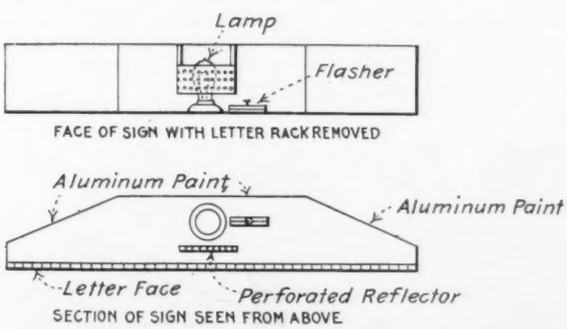
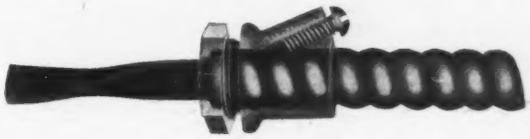


FIG. 1—SIGN WITH SINGLE LAMP AND PERFORATED REFLECTOR

FIGS. 2 AND 3—SINGLE-LAMP SIGN WITH LETTERS REMOVED AND COMPLETE

Cable-Box Connector

The device shown herewith is used for fastening steel-armored cable to the panel box at the place it enters the box. The fastener consists of two parts, (1) an internally threaded collar attached to the end of the armored cable and (2) an externally threaded bushing with an octagonal head which is fitted into the panel-box inlet and screwed into the collar. The collar is securely fastened to the armor by a set-screw the axis of which is inclined to give wedge action. The screw prevents the armor turning or pulling out because the greater the force tending to separate the collar and armor the tighter are they wedged together. The device, which is known as the "Kwikon," is manufactured by S. R. Fralick & Company, 15 South Clinton Street, Chicago, Ill.



DEVICE FOR ATTACHING ARMORED CABLE TO PANEL BOX

Small-Sized Self-Starting Alternating-Current Motors

Small-sized alternating-current motors rated at 0.1 hp and over are being placed on the market by the Electric Specialty Company, Stamford, Conn. These motors are of the split-phase, squirrel-cage, induction type, and are designed to operate quietly. No outside casing is used. The rise of temperature on any part of these

SMALL ALTERNATING-CURRENT MOTOR

machines, the manufacturers claim, does not exceed 30 deg. C. The bearings are made of phosphor bronze and are extra large. The smaller motors are equipped with oil-wick feed and those of ⅓-hp rating or more with oil-ring bearings.

Construction Cleats

According to the claims of the manufacturers, uniform and accurate placing of all outlets, whether ceiling, switch or bracket, is possible with the cleat shown in the accompanying illustrations. It permits the use

FIG. 1—CONSTRUCTION CLEAT

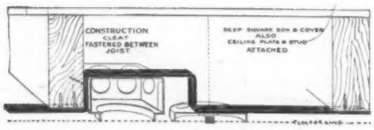


FIG. 2—CLEAT IN PLACE

of deep, round or square outlet boxes and ceiling plates with any standard fixture stud. The cleat can be fastened between joists, as shown in Fig. 2. This cleat is being made by the Alex. M. Knauber Company, 742 South Euclid Avenue, Oak Park, Ill.

Graphic Meters for Seven-Day Continuous Operation

Light-weight graphic meters which are particularly adapted to purposes where both simplicity and accuracy of operation are required are being marketed by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa. The operating mechanism of these

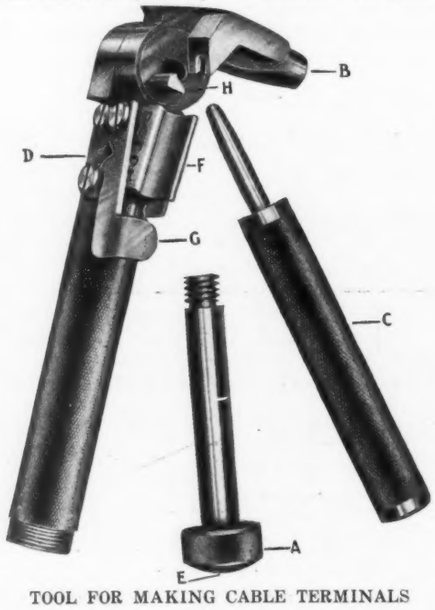
GRAPHIC METER WITH 168-HOUR TAPE

instruments consists of a solenoid core acting directly on the lever carrying the recording pen, under which a continuous strip of paper is moved uniformly by clock mechanism. The movement of the pen is controlled by a heavy spring which counterbalances the pull of the solenoid and also minimizes inaccuracies due to slight errors in leveling. An oil dash-pot is provided to damp the movement of the pen with fluctuating currents or potentials. On circuits not subject to excessive fluctuations no oil need be placed in the dash-pot.

The pen is in the form of a pointed V-shaped trough, which, as the ink is used, is refilled by a wick having one end immersed in a glass ink reservoir. The record paper is 3.25 in. wide, but a width of only 2.25 in. is calibrated. The hours are stamped along the left-hand side of the scale and the remainder of both margins is perforated to mesh with the driving mechanism, thereby preventing slippage. The tapes are made for 168-hour continuous operation.

Terminal Tool

A tool for making terminals on wires or small cables used in connection with automobile and marine engines is shown herewith. This tool will strip the insulation for the required distance and force into place a terminal. For high-tension wiring this terminal consists of a straight brass tube or sleeve of such a diameter as to fit snugly over the stranded wire generally employed for this service. For low-tension work there is used a tube with one end expanded so as to slip over the insulation and form the terminal into a loop. The insulation is cut by the knife blade *G* shown in the illustration. After slipping the terminal tube over the bare wire, the latter is inserted in the hole *E* at the end of the handle *A*, which is screwed into the movable part of the tool *B*. By forcing the cable down the terminal is pushed under the insulation until the end of the hole is flush with the conductor. The cable is next laid in the measuring groove *F*, and is forced forward until the end of the insulation comes against the stop *H*, when the pin *C* is inserted from the right into the center hole and worked or forced into a vertical position. By pulling the handle *A* around toward the operator in a clockwise direction, a loop is formed. Re-opening the



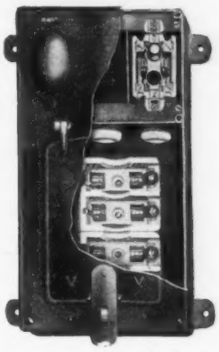
TOOL FOR MAKING CABLE TERMINALS

handle and withdrawing the pin *C*, the operation is completed. When not in use the pin *C* can be inclosed in the handle of the instrument and the handle *A* can be screwed into the end.

This tool is being manufactured by the Bosch Magneto Company, 223 West Forty-sixth Street, New York.

Weatherproof Combination Switch Box

Illustrated herewith is a weatherproof combination cutout and push-button switch box especially adapted for use in abattoirs, packing houses, mines, greenhouses and other damp places. The box, which is made of cast iron with a heavy, baked, black-enamel finish is designed to accommodate either plug or cartridge-fuse

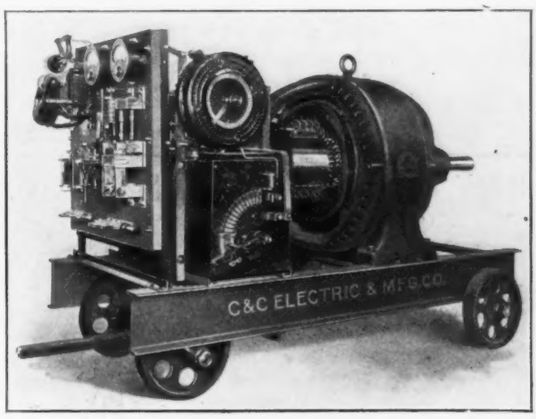


WEATHERPROOF CABINET CONTAINING SWITCHES AND FUSE CUTOUTS

cutouts and flush-type push-button switches. The cover is fastened with six brass screws and is made watertight with a heavy rubber gasket. Additional hinged covers protect the entrance to the push-buttons from dust and moisture. The entrance to the cutouts is similarly protected by a hinged door (gravity-closing) provided with a rubber gasket and an attachment for a lock and key. This switch and fuse box is manufactured by the V. V. Fittings Company, Philadelphia, Pa.

Portable Welding Apparatus

Portable electric-arc welding outfits, each consisting of a dynamotor, control apparatus and two welding circuits, have been placed on the market by the C. & C. Electric & Manufacturing Company, Garwood, N. J. The apparatus is mounted on heavy iron trucks, and the dynamotor will operate on 110-volt energy or may be belt-driven by some auxiliary prime mover. It is designed to furnish 14 kw at 70 volts. When electricity



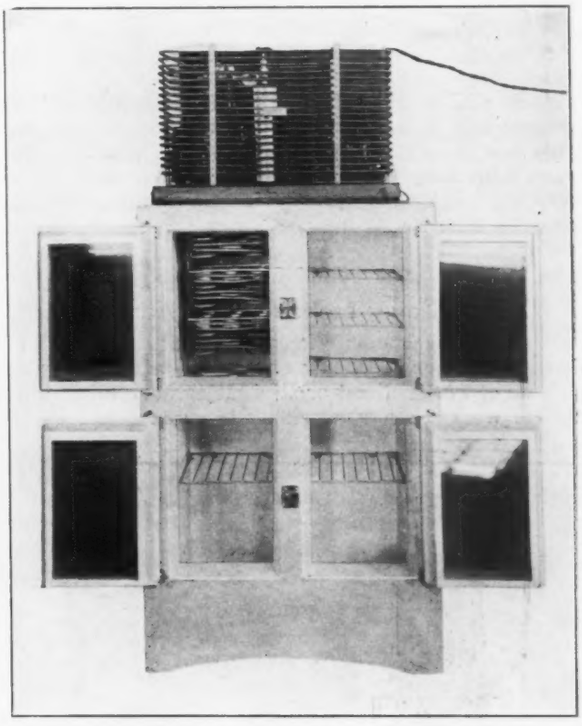
PORTABLE ELECTRIC ARC WELDER

is not available for driving the dynamotor a pulley may be slipped over its extended shaft and a steam or internal-combustion engine employed to drive it through a belt. With graphite electrodes connected to the dynamotor leads a temperature of 4000 deg. C. can be obtained at the arc for cutting or preheating metal preparatory to welding. A bar of metal or flux has to be used in conjunction with the carbon electrodes when welding. If metallic electrodes are employed no auxiliary bar is required and welding may be done on vertical and overhead work. The switchboard contains a main-line circuit-breaker and switch and automatic-control relays which regulate the amount of ballast resistance in series with the arc circuit.

Electric Refrigerating Outfit Applicable to Any Ice-Box

A motor-driven refrigerating outfit which can be attached to any ice-box or used in conjunction with a specially insulated box designed to maintain very low temperatures has been developed by the Mechanical Refrigerator Company, 1020 Willow Street, Chicago, Ill. The set consists of a 0.33-hp motor driving a compressor which delivers gas under a pressure of 70 lb. per sq. in. to radiating coils and thence to expansion coils installed in the refrigerator. The radiating coils, which consist of 100 ft. of 0.375-in. copper tubing, form a guard around the motor and compressor. One hundred and thirty feet of the same size of copper tubing forms the cooling coils. These are installed in the compartment usually devoted to ice. A thermostat which can be set to open or close a contact at any temperature in the neighborhood of 32 deg. Fahr. is employed to control the motor. No water is required to cool the compressed gas.

At ordinary electric-service rates the 100-lb. town-house-size refrigerating plant will operate at a cost of 5 cents to 10 cents per day, and the country-home 200-lb. size at 10 cents to 15 cents per day. It is declared that a well-insulated box measuring 5 ft. by 3 ft. by 2.5 ft. may be kept at a temperature of 17 deg. Fahr. with the smaller-sized apparatus. A test conducted by Mr. R. W. Brown, of the Spring Valley (Ill.) Utilities Company, over a period of thirty-four days, is said to have shown that this outfit will consume practically 1 kw-hr. a day in hot weather.



ELECTRICAL REFRIGERATING OUTFIT

Indirect-Lighting Fixture

An indirect-lighting fixture without chains is being made by the Illinois Electric Company, 308 West Madison Street, Chicago, Ill. The bowl is of white porcelain-enameled steel and the other parts are of brass. The

INDIRECT LIGHTING FIXTURE WITH PORCELAIN BOWL

bowl can be easily removed for cleaning without disturbing any of the other parts. This fixture, which is called the "illinilite," is designed for 750-watt and 1000-watt tungsten lamps. The length of the fixture is 36 in., and the diameter of the bowl for the 1000-watt lamps is 24 in. and for the 750-watt units 22 in.

Long-Burning Inclosed Flame-Arc Lamps

The inclosed flame-arc lamps illustrated herewith are declared to burn 100 hours at a single trimming. They operate on either direct or alternating current, and they can be worked singly at 65 volts or in series of two units at 110 volts or four units at 220 volts. The body of the lamp consists of an air-tight tubular frame, inclosed at the upper end by a solenoid and at the lower end by the inner globe. The parts of the lamp subject to the magnetic field are of nickel-plated iron. All other materials in the body of the lamp are of brass or copper. The series coil is wound with bare aluminum wire insulated by a method of oxidation devised by the manufacturers. The shunt coil, which is wound with many turns of fine wire, is said to require only 0.2 amp to energize it. Energy is led to the upper electrode through a copper spiral cord which connects to the carbon holder. When a certain length of the top carbon has been consumed the arc is cut out automatically, the carbon holder being prevented from falling below a certain point. The magnetic core is a combination of dash-pot and carbon clutch mounted in the center of the lamp. The covers are rain-proof and are insulated from the lamp frame. With the lamps in series the resistance is separate from the lamps, one set being sufficient for each series group. In the case of single lamps arranged in parallel the line resistance is placed inside the lamp. These lamps are manufactured by the Regina Bogenlampen-Gesellschaft, Köln-Klettenberg, Germany, and Mr. W. E. Güssefeld, 136 Liberty Street, New York City, is the importing agent in this country.

FIG. 1—FLAME-ARC LAMP, ENAMELED REFLECTOR

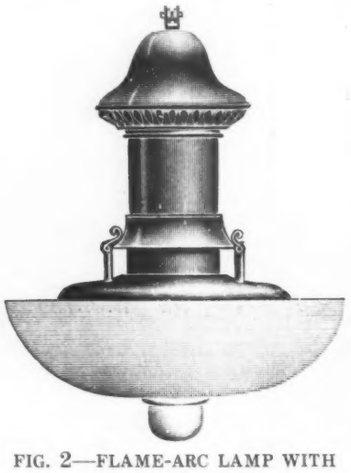


FIG. 2—FLAME-ARC LAMP WITH DIFFUSING GLOBE

Reversible-Bowl Pendent Fixtures

Pendent lighting fixtures having bowls which may be supported in either of two ways to give respectively direct or indirect illumination are being marketed by the F. W. Wakefield Brass Company, Vermilion, Ohio. They are furnished with either opalescent-glass or enameled-steel bowls supported by flexible attachments which permit the bowl to assume a symmetrical position with respect to the central axis. Metal straps following the contour of the bowl and attached to metal bands around its rim and apex give an artistic appearance to the fixture and provide means for supporting the bowl. By detaching one of the supports it is possible to lower the bowl for cleaning. Lamps of 1000 watts can be accommodated in this fixture by using "mogul" sockets, while units as large as 250 watts can be employed with regular sockets. These fixtures are also adapted to hold nitrogen-filled lamps. Being equipped with insulated ceiling canopies, the fixtures may be attached to any standard outlet box or directly to the ceiling without additional insulation.

FIG. 1 — BOWL IN INDIRECT POSITION

FIG. 2—BOWL REVERSED

Jobber, Dealer and Contractor

Fluttering-Moth Effect for Window Display

Novel show-window displays are constantly being installed to attract the public to the products sold within. The proprietors of a certain hardware and electrical supply store in New York have had one of their show

DISPLAY REPRESENTING FLUTTERING MOTHS

windows equipped to represent varicolored moths hovering around an electric-lamp fixture. The display attracts considerable attention and yet it was simple and inexpensive to install. Stretched on a wire frame supported by the electric fixture is a balloon-shaped bag made of mosquito netting. The lower end of this converges and is attached to the periphery of the wire guard on an electric fan whose axis is vertical. A piece of netting is also stretched over the guard. The hovering-moth effect is produced by suspended confetti, which are caused to flutter around the lamp by the breeze from the fan.

A Shrewd Contractor

During a lively house-wiring campaign at Danville, Ill., the central-station solicitors were graded according to the business they were able to secure, the least productive members of the organization being eliminated from time to time. One of the salesmen, knowing that his grade had been low for some time, became desperate in his quest for business and even went to the extent of trying to secure a wiring contract from a local electrical contractor who was at that time erecting a house for himself. After several calls the salesman secured the signed contract. This order was taken to the lighting company's office, put through the regular routine, and returned to the contractor, granting him permission to wire his house and to pay the company for the work on easy terms. The work was done and the payments made in regular course, the shrewd contractor thus profiting by twelve months' use of the lighting company's investment in his own wiring.

Convention Outing of Wisconsin Contractors

The Electrical Contractors' Association of Wisconsin held its summer convention outing on Aug. 13, 14 and 15. Members, with their wives, assembled in Oshkosh at the Hotel Athearn at 8 p. m. on Aug. 12 for an informal dinner. The following morning they went aboard the *Mayflower, Jr.*, for a three-day lake-and-river trip to New London, Winneconne, Omro and Berlin, returning to Oshkosh in the afternoon of Aug. 15.

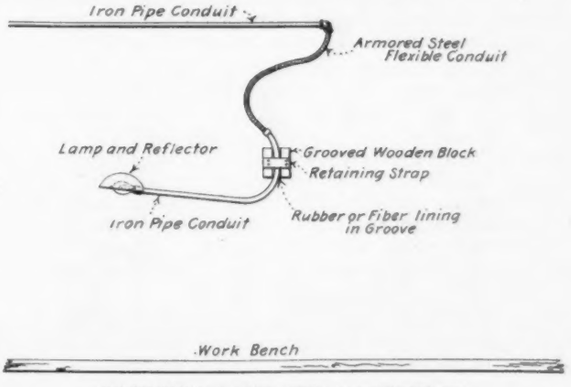
Registration of Contractors in Chicago

In reference to the registration of electrical contractors, Mr. Ray Palmer, commissioner of gas and electricity for the city of Chicago, has this to say in his recent annual report: "An amendment to the city ordinance which went into effect on Nov. 1, 1913, provides for the registration of all companies or persons obtaining permits for electrical work. The essential requirement of this ordinance is that the electrical work must be done under the supervision of a thoroughly competent electrician. On Dec. 1, 1913, 690 certificates had been issued." The number of contractors registered on Aug. 8, 1914, was 1031.

A Handy Swinging Bench Lamp

Notwithstanding the fact that legitimate electrical contractors are universally interested in good wiring and good illumination, their own workbenches, which are generally at the rear of their shops, are almost invariably subject to unsatisfactory working conditions as far as artificial lighting is concerned. A sketch herewith shows a method of equipping such workbenches with lighting units which will not only supply general illumination but will also enable workmen to concentrate the light at any desired point. The entire outfit is inexpensive and can be made and installed easily. An iron pipe conduit is brought along the wall and terminates at a point above the center of the bench. To this conduit is attached a 3-ft. piece of steel-taped conduit leading to the curved pipe which serves as the fixture.

To provide the desired freedom of motion for the lamp, the curved portion of the improvised fixture is held rather loosely in the fiber-lined groove of a small



SWINGING LAMP FOR WORKBENCH

wooden block. A retaining strip of fiber which fixes the bent conduit in place is made not wide enough to obstruct vertical movement of the pipe, but yet of such size as to hold the pipe in place under the weight of the lamp, fixture and conduit. The lamp is thus not only allowed free movement in the horizontal plane but is also permitted to be shifted vertically.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Map of European War Operation.—Pass & Seymour, Inc., Solvay, N. Y., have issued a pocket-sized map of the war zone of Europe and are distributing these maps to their patrons.

Large Lighting Fixture.—A large lighting fixture of compodura measuring 10 ft. in diameter and 8 ft. high clear of its suspensions, which is now installed in a Chicago theater, and is said to be the largest ever made, is described in a pamphlet issued by R. Williamson & Company, of Chicago, makers of the fixture.

Electric Company Moving to Newark.—The Star Electric Company, of Binghamton, N. Y., manufacturer of fire alarms and police telephone systems, has notified its employees, it is reported, that the plant will be moved to Newark, N. J. The company employs about 160 workmen, many of whom will probably accompany the plant to its new location.

New Business in Byllesby Properties.—A gain of 218 kw in lighting load and 896 hp in motors is shown by the combined report of all Byllesby electric properties reporting for the week ended July 31. New business contracted for —but not yet connected—included 886 customers with 497 kw lighting load and 669 hp in motors. Electric output of the properties for the week was 7,187,856 kw-hr., a gain of 11.6 per cent over the corresponding week of 1913.

Home Exposition in Chicago.—A "Home Exposition" is to be held in the Coliseum, Chicago, Sept. 16 to 26. Among the prospective exhibitors, as announced by the management, are the American Ironing Machine Company, Capital Electric Company, Chicago Electric Motor Company, Conlon Electric Washer Company, Eden Electric Washer Company, Federal Sign System (Electric), Franz Premier Electric Company, and Judd Laundry Machine Company.

War Will Handicap German Electrical Trade for Ten Years.—Mr. Cummings C. Chesney, general manager of the Pittsfield (Mass.) branch of the General Electric Company, recently returned from a trip through Germany and other European countries, and in a recent newspaper interview declared that the present war will impose a handicap of at least ten years' time on the future development of Germany's electrical manufactures. In the meantime, according to Mr. Chesney's prediction, the electrical manufacturers of this country will be greatly benefited.

Canadian Electric Company's Patriotic Offer.—The Canadian General Electric Company has offered to raise, equip and pay the salaries of a company of twenty-five skilled electrical and mechanical workmen for service in Canada under the control of the Dominion Department of Militia. In response to President F. Nicholls' telegram tendering the services of these men the Canadian Premier expressed the government's appreciation of the company's patriotic offer and explained that the telegram had been submitted to the Minister of Militia, who would communicate with Mr. Nicholls regarding it.

Gas Producer Supplanted by Central-Station Drive in Ice Factory.—The Boren Ice Company, of Chicago, has recently abandoned its gas-producer equipment and has entered into a contract with the Commonwealth Edison Company for electric service. The rated capacity of the plant is 50 tons of ice a day, and since all operations are to be conducted electrically, 200 hp in three-phase motors will be installed. With this plant added to its lines the Commonwealth Edison Company will be operating a total of seventeen ice plants, the aggregate rating of which is 1628 tons of ice a day. The operation of these seventeen plants, according to a statement by Mr. G. H. Jones, power engineer, requires 5722 hp in three-phase motors.

Electrical Equipment for Automobiles.—The McFarlan Motor Car Company, Connersville, Ind., has adopted the Westinghouse starting, lighting and ignition systems for its 1915-model car. This equipment consists of a starting motor and switch and combination ignition and lighting generator complete with switches and meters. The Vulcan Manufacturing Company, Painesville, Ohio, will also use the Westinghouse starting, lighting and ignition systems on its cars. This equipment will consist of a starting motor with Bendix screw-shift reduction gears and housing, a combination ignition and lighting generator, switches, etc. Other companies which install the Westinghouse apparatus on their cars are the Speedwell Motor Company, Dayton, Ohio; the Briggs-Detroiter Company, Detroit, Mich., and the Kissell Motor Car Company, Hartford, Conn.

Central-Station Business for May—Summary of Data.—Throughout the country as a whole there were no abnormal factors affecting the output of the central stations during the month of May last, and the expansion over the same period last year has been about on a par with the rates of increase obtaining in previous months of this year. Here and there slumps have been noticed, while other sections of the country have reported abnormally heavy increases. Such instances have been already noted in the *Electrical World*, in the weekly review of the condition of the business in the various groups of states; and, for convenience, the segregated data for these groups are collected here in Table I. It will be seen that the May figures for very nearly 200 operating systems are included, and between them these companies generate about one-half of all the energy distributed by the electric service systems of the country. Perhaps the only necessary comment upon this tabulation is in regard to the increased rate for energy output registered by the companies in the Middle West and in the New England States. For the central-station industry in the Middle West generally the value developed from the *Electrical World* returns is too high for a true average; while for New England as a whole the *Electrical World* figure is considerably too low. Though it may be true that some of the larger companies in the Central States are this year distributing probably 15 and 20 per cent more energy than they did last year, yet a fair average for the section cannot be more than 10 to 12 per cent, at least so far as the cities of less than 50,000 population are concerned; while from New England the *Electrical World* has received concrete evidence to show that in practically all the larger cities there is an increased output this year of at least 9 or 10 per cent. The opinion may safely be hazarded that if the figures for energy demand on the part of the industries may be depended upon as a barometer of trade, then the Middle West as a whole is, from an industrial standpoint, considerably busier than New England as a whole; and at the present time the smaller cities in the latter section seem to be calling for very little more energy in their industries than they did last year. From the table it might appear that the Pacific is as active just now as the Atlantic. Actually the returns from the Pacific States given in this table are so little representative of the industry on the coast as a whole that it would be unwise to base any general conclusion upon the data. It is known that the Pacific companies which are really registering satisfactory increases over last year are very few in number, and it must be confessed that the signs of any substantial uplift in the industries there have not yet become very obvious. Table II shows again that May has been a fairly normal month. Therein are tabulated the combined totals for gross income and energy output of all the companies reporting to the *Electrical World*. Data for May are available for 156 companies or groups of companies, and it will be seen that there has been

an increase in income for the month from $12,889,000 in 1913 to $14,071,900 in 1914, or at a rate of 9.1 per cent; while energy output increased in the same time from 590,994,257 kw-hr. to 658,708,198 kw-hr., or at a rate of 11.5 per cent. The totals for May for all companies reporting to the *Electrical World* (shown in Table II) are somewhat higher than the combined totals of the segregated properties shown in Table I, for the reason that many of the data received relate to groups of operating companies controlled by a syndicate or holding company and scattered in various parts of the country. Of course, no geographical segregation of such returns can safely be attempted. Figures from these groups are included in the second table, and the 156 returns therein relate to considerably more than 200 individual operating companies. Earnings of street-railway properties are not included in the figures for income, but energy sold by central stations for the operation of electric railways is, of course, regarded as strictly central-station output and is included with the energy distributed in the lighting and motor-service field. Some explanation should be given of the fact that, in point of magnitude, the totals for May appear so much less representative than for the two previous months in spite of there being a larger number of companies reporting for the last month. Three factors will account for this condition. One or two of the larger companies included in March and April have not yet rendered any statement as to their May operations, and between them these companies handle an amount of business equal to from twenty to thirty of the smaller utilities now included in the list. In addition to this, there was some artificial swelling of the April and March totals owing to a certain amount of inevitable overlapping of returns. In one or two cases figures from an individual operating company were thrown into the totals, when actually the same figures were being returned by the parent company in its report for a large section of country in which that particular subsidiary operated. Such duplication has, it is believed, been entirely eliminated from the May aggregate. There remains, of course, the third reason, that, for the country as a whole, the energy demand upon the central-station companies is less in May than in April, in spite of the extra day which is reckoned in the former calendar month. The figures for gross income never move strictly in step with those for output, and it may even be that in May the companies collected more money on their monthly bills than in April for a reduced output. It will be seen that, for the companies included in the table, there was an increase in gross income for the month of $1,182,000 as compared with last year; and as these utilities between them represent about one-half of the entire light and motor-service field, it is safe to say that there was an increase for the whole industry of well over $2,000,000. There remains the big question of how a monthly expansion of this magnitude is now going to be financed. Directly the possibility of even a localized European war first loomed up the bankers here became very apprehensive as to the effect which such a calamity might have upon the foreign market for American electrical securities. Now that the trouble has assumed the awful proportions of a general European fight-to-a-finish, involving one great nation after another, completely shattering the entire financial system of the whole continent, and even seriously imperiling the financial equilibrium of this country, the immediate future of all utility financing here has become gravely threatened. Leaders in the electric-service field have given public expression to their views that the outlook may be faced with perfect confidence; but at least it is certain that from a financial standpoint the next few months are going to prove a more serious trial to the operators than any which they have ever experienced. No financing of any kind is being carried out at present, and it would seem questionable whether any utility underwriting worth mentioning can be carried out for some months at least. For the present, maintenance, construction and any necessary extensions will have to be performed from earnings, and no serious trouble may result from this so long as earnings can be maintained. That, unfortunately, is beyond the control of the operator; and there are already indications that in some sections of the country the industrial demand is to be curtailed until Atlantic shipping facilities are once more in a normal condition. The most hopeful feature of the situation is that such a state of affairs is not likely to be very long delayed. When that point has been reached it is unlikely that there will be any widespread falling off in the gross income of the electric utilities. Uncertainty as to the future is the worst foe of the investment market, however. Until the average American investor can see much more clearly than he can now what is likely to be the earning power of any utilities whose securities he may be considering it is unlikely that he will be willing to lend the support of his capital as readily as he has in the past. With the supply of European funds completely cut off, American properties from now on will have to rely upon domestic capital to a far greater degree than formerly. That inevitably entails a certain amount of adjustment, and adjustment takes time.

TABLE I—CENTRAL STATION DATA FOR MAY, 1914 AND 1913. COMPARATIVE INCOME AND OUTPUT OF COMPANIES REPORTING TO ELECTRICAL WORLD, BY GROUPS OF STATES

	Gross Income from Sale of Energy			Total Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
Atlantic (75 companies)..	$6,121,907	$5,670,820	8.0	221,356,523	205,696,988	7.8
Central (64 companies)..	3,264,178	2,900,150	12.7	194,285,892	164,174,157	18.3
New England (41 companies).....	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
Pacific and Mountain (15 companies)..	1,332,715	1,238,407	7.7	127,428,535	118,352,280	7.7

TABLE II—COMPARATIVE INCOME AND OUTPUT FOR MARCH, APRIL AND MAY, 1914, FOR ALL COMPANIES (OR GROUPS OF COMPANIES) REPORTING TO THE ELECTRICAL WORLD

	Gross Income from Sale of Energy			Total Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
March (84 companies or groups).....	$16,891,235	$15,559,191	8.7	730,843,220	642,291,906	13.8
April (130 companies or groups).....	18,027,619	16,359,594	10.2	722,952,419	634,005,739	14.1
May (156 companies or groups).....	14,071,900	12,889,000	9.1	658,708,198	590,994,257	11.5

NEW YORK METAL MARKET PRICES

Copper	Aug. 11 Bid	Aug. 11 Asked	Aug. 18 Bid	Aug. 18 Asked
Standard spot*				
	Selling Prices		Selling Prices	
	£ s d		£ s d	
London, standard spot*				
Prime Lake	12.50	to 12.75†	12.50	to 12.62½†
Electrolytic	12.25	to 12.50†	12.25	to 12.37½†
Casting	12.12½	to 12.25†	12.10	to 12.20†
Copper wire base	13.75	to 14.00	13.75	to 14.00
Lead	3.90		3.90	
Nickel	40.00	to 45.00	40.00	to 45.00
Sheet zinc, f.o.b. smelter	7.00		7.25	
Spelter, spot	5.40	to 5.50	5.75	to 5.85
Aluminum:				
Prompt delivery	20.00	to 21.00	20.00	to 21.00

*COPPER EXPORTS

Total tons to June 9 9472

*From daily transactions on the New York Metal Exchange.
†Nominal.
NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

Corporate and Financial

International Power Company.—Chancellor Walker of New Jersey has granted a continuance of the receivership proceeding against the International Power Company upon representation that the company's officials had agreed to comply forthwith with a mandamus from the Supreme Court directing the company to produce its books and records for examination.

Laurentide Company Special Meeting.—A special meeting of the Laurentide Company, Montreal, Quebec, is being called for the purpose of obtaining the necessary authority to issue 6 per cent bonds to enable the company to carry out financial plans decided on when the last issue of common stock was made. The issue will be sufficient for the taking up of the present issue and also to provide money for additions to the paper plant and the power development under way and at the same time leave a large sum in the treasury.

Public Utility Securities.—Messrs. William, Dunbar & Coleman, New York, dealers in public utility securities, have made the following statement regarding the effect of war upon public utilities: "Public utilities in the United States cannot materially be affected by any war outside of this country, and earnings will continue to increase as they have in the past. Gas and electricity must be used in the home, office, factory and numerous institutions, and this will insure good earnings and continuous profits. Reports during the week from several public utility corporations confirm the continuous growth of this class of corporations and indicate clearly the undisturbed underlying condition of these public service organizations."

War Brings Benefits to Public Utility Investors.—In speaking of the benefits acruing to the investor in public utility securities as a result of the present European conflict, Mr. J. J. Bodell, a New England banker, is quoted as saying that "We are soon to see security prices well above those of the last few days of liquidation. It is public utility securities, however, to which I would particularly draw the attention of the investor. The companies issuing them are furnishers of necessities, of light, of heat, of power and of urban transportation. Because of the war there will be no diminution of electric energy used, and the industrial activity which is bound to come will call for additional power loans by our industrial establishments, all going to make up larger earnings for these companies."

Consolidated Gas, Electric Light & Power Company of Baltimore.—The company has increased the quarterly dividend on the common stock from 1½ per cent to 1¾ per cent, thus placing the stock on a 7 per cent basis. The company has sent out a plan for the exchange of preferred stock into common stock. On or before Sept. 19 all holders of preferred stock may exchange share for share their preferred stock for common stock, and in so doing receive the quarterly dividend of 1¾ per cent declared on the common stock Aug. 13. The preferred stock is 6 per cent stock. The maximum amount of debenture stock that can be issued under existing conditions is outstanding; $4,000,000 of debenture stock has been sold by the company abroad, where that class of security has been popular.

Pacific Gas & Electric Company Plan Declared Effective.—The permanent financing plan of the company as set forth in the *Electrical World* of June 20 has been declared operative. Of the $12,500,000 new preferred stock, it is announced that $8,750,000, or 70 per cent, has been subscribed for by 3000 persons. It has also been announced that owing to the existing financial conditions payment of the second instalment of $15 a share has been postponed from Aug. 15 to Oct. 15, and the third payment of $12.50 a share has been put back from Oct. 1 to Nov. 15, the final instalment being due Jan. 15 instead of Jan. 1. As a further effort toward the consummation of their permanent financing plan after the stockholders had made their subscriptions and 40 per cent of the company's permanent staff had become stockholders the privilege was given to the customers of the company of subscribing on the same terms as the others to the 6 per cent preferred stock. This stock is offered at $82.50, thus yielding 7.27 per cent on the investment.

Cities Service Company's Letter.—As was noted in our issue of Aug. 8, the Cities Service Company has decided, in view of the present unsettled condition of the money market, to issue from time to time a letter to the stockholders thereby keeping them definitely in touch with the company. We are quoting herewith in full the second letter, sent out by President H. L. Doherty: "Your directors adjourned the meeting planned to be held on Friday, Aug. 7, until Monday, Aug. 10, to secure the presence and advice of Messrs. Mitchell and Brown, who were passengers on the *Mauretania* from England and were delayed in their arrival in New York. At the meeting to-day the general financial and business situation as it now exists and the probable outcome were carefully considered. The situation to-day can be summed up by the statement that practically every stock and commodity exchange in the world is closed, a moratorium has been declared in Great Britain and France until the end of August, and a moratorium in effect practically exists in every financial center of the world. It was the opinion of all that events subsequent to the last meeting of the board of directors fully justified the wisdom of the action of your directors in deferring the payment of further cash dividends for the present. It is still practically impossible to transfer money from one country to the other for the payment of dividends or for any other purpose. Your directors therefore decided to postpone further action until future developments would enable an accurate forecast to be made, and instructed the executive committee to keep in close touch with the general situation and the affairs of the company and to be prepared to make definite recommendation to the board at the earliest opportunity. Many of our stockholders were not in close touch with the financial situation as it existed at the time your directors decided to defer the payment of cash dividends and are only now awakening to the severity of the disturbance and may be led to believe that the situation is growing worse instead of better. Your directors are of the opinion that the situation is improving daily, and much credit is due to the administration in providing governmental aid by the prompt supply of emergency currency. Our managers generally report that business continues to be good but that some difficulty is being experienced in making collections from large customers. Our manager at Galveston however reports that shipping from that port is at a complete standstill. Galveston is the second largest export port in the United States. Unless this condition is long maintained we anticipate no serious diminution in the earnings of the Galveston company. Of course it is impossible at this time to predict accurately the effect upon collections and earnings, but your directors see no reason to be alarmed over the probability of the earnings of the subsidiary companies being seriously affected—in fact, they feel that recent developments are rather favorable than otherwise. When the board last met the entire export business of this country was seriously threatened, while to-day there seems to be the possibility of normal shipping facilities being established in the near future. While your directors deeply deplore the results which are bound to be experienced from the present situation, they feel that the holders of public utility securities will have every reason to feel that they have been fortunate in their choice of investment, and especially in their holdings of stocks in companies, such as Cties Service Company, which represents a wide diversity of several lines of effort in widely scattered communities from seaboard to interior cities principally dependent upon agriculture. The stockholders of the company may feel sure that everything will be done to protect and promote their interests, and that the management will be in touch with every turn that the general situation may take. We have been at all times in exceptionally close touch with the European situation, and, while it is no longer possible to communicate by cable using private codes, we will be as close to the developments there as anybody can be. While we may have seemed to be the first to be alarmed over the situation, we think that this was due to our closer and more intimate contact with events. What has seemed such bad news to many people during the last week or ten days is rather encouraging to us than otherwise; and, bad as the present situation may seem, it is, on the whole, vastly improved—and we believe that we can predict that recent developments insure further improvement. We will keep our stockholders advised from time to time, and hope that subsequent developments will permit us to continually give more encouraging reports."

Business Notes

The Splitdorf Electrical Company of Newark, N. J., has appointed H. R. Curtis manager of its Boston office.

M. R. Johnson, formerly with the Caldwell Electric Company, of Champaign, Ill., has gone into business for himself at 84 North Neil Street, Champaign.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.—C. C. Curry has been appointed acting manager of the Minneapolis office of the Westinghouse company.

The Electric Supply & Equipment Company, Hartford, Conn., announces that J. O. Morris has been elected secretary and sales manager to fill the vacancy caused by the resignation of T. J. O'Brien.

The General Motors Truck Company.—Z. C. Elkin, formerly manager of the Thos. B. Jeffery Company's Chicago branch, has been appointed manager of the Chicago branch of the General Motors Truck Company.

The Pittsburgh Transformer Company, Pittsburgh, Pa., has opened a branch office at 724 Harris Trust Building, Chicago, Ill. The office will be in charge of C. R. Lininger, who will be manager of the Western district.

The H. W. Johns-Manville Company.—Frank E. Brown has joined the staff of the H. W. Johns-Manville Company as special representative to devote his attention to the sales development of "Noark" service-meter protective devices. Mr. Brown was for twenty years (1889 to 1909) electrical engineer for the Department of Water Supply, Gas and Electricity, New York City

Becker Brothers, of Chicago, have incorporated their partnership business. The company manufactures carbon, graphite and metal brushes, and also does an extensive repairing business. It controls the American Maintenance Company. The board of directors is composed of C. J. Becker, W. F. Becker and O. E. Becker. O. E. Becker is president and treasurer and C. J. Becker is vice-president and secretary.

The National Electrical & Engineering Company, Ltd., which has recently opened an office at 202 Hereford Street, Christchurch, New Zealand, reports that it is now in a position to establish business relations with American manufacturers. This company is sole agent for the General Electric Company, the British Thomson-Houston Company and the British Insulated & Helsby Cables, Ltd. Nelson Jones is manager and engineer for the company.

New Industrial Companies

The Engeln Electric Company, of Cleveland, Ohio, has been incorporated with a capital stock of $25,000 by H. K. Zelchi, W. M. Findley, B. J. Cuthery, R. E. Williams and H. W. Kodel. The company purposes to deal in electrical supplies.

The American Electric Clock Company, of Cleveland, Ohio, has been chartered with a capital stock of $100,000 to manufacture electric time-keeping systems and similar devices. The incorporators are J. G. and R. H. Bricker, L. R. Houston and J. A. Dunn.

The Coe-Halstead Company, of Portland, Maine, has been incorporated with a capital stock of $1,000,000 to do a general electrical and civil engineering business; also as machinists, toolmakers, etc. A. F. Jones is president and T. L. Croteau treasurer, both of Portland, Maine.

The Hughes-Lippincott Company, of Camden, N. J., has been incorporated by W. Lippincott, of Haddon Heights; J. W. Hughes, of Narberth, Pa., and A. M. McNutt, of Collingswood. The company is capitalized at $125,000 and purposes to do a general consulting engineering business.

The Commonwealth Electric Tool Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $200,000 for the purpose of manufacturing and dealing in electrically operated tools, motors, controllers, etc. The incorporators are H. E. Latter, O. F. Reichard and N. P. Coffin, of Wilmington, Del.

Trade Publications

Turbines.—"How the Chief Engineer Was Convinced" published by the B. F. Sturtevant Company, Boston, Mass., describes and illustrates Sturtevant turbines.

Wiring Accessories.—Loose-leaf catalog fillers containing the prices of wiring accessories have been prepared by the Illinois Electric Company, Los Angeles, Cal.

Train Dispatching.—The Western Electric Company has issued a booklet describing in detail the part played by the telephone in modern methods of train dispatching.

Tamping Machines.—Engine-driven machines for tamping trenches are described in Bulletin No. 8 prepared by the Pawling & Harnischfeger Company, Milwaukee, Wis.

Plugs and Receptacles.—Interchangeable two and three-wire plugs and receptacles are described in a folder being distributed by Harvey Hubbell, Inc., Bridgeport, Conn.

Switch Boxes.—Methods of installing "Bauer" switch boxes are described in a folder being distributed by the Bauer Switch Box Manufacturing Company, Cleveland, Ohio.

Diesel Oil Engines.—Bulletins No. 51, 53 and 54 issued by the McIntosh & Seymour Corporation, Auburn, N. Y., describe Diesel oil engines with individual and box frames.

Jet Condensers.—Eductor and multiple-jet condensers made by the Schutte & Koerting Company, Philadelphia, Pa., are described in Catalog 5, Section AB, issued by that company.

Improved End-Cell Switch.—An improved end-cell switch developed by the Electric Storage Battery Company, Philadelphia, Pa., is described in Bulletin No. 145 issued by that organization.

Polyphase Induction Motors.—Squirrel-cage and wound-rotor polyphase induction motors are described in Bulletin No. 1087, issued by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Axle-Driven Lighting Generator.—A constant-voltage axle-driven generator for railway-car lighting is described in Bulletin No. 144 issued by the Electric Storage Battery Company, Philadelphia, Pa.

Kerosene-Engine-Driven Generating Sets.—Unit-type kerosene-engine-driven generating sets built by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., are described in its Bulletin No. 1085.

Lamp Standards.—Sectional pressed-metal reinforced lamp standards manufactured by the Union Metal Manufacturing Company, Canton, Ohio, are described in a circular prepared by that company.

Power Transmission Machinery.—The Cresson-Morris Company, successor to the George V. Cresson Company, 90 West Street, New York City, has prepared Catalog A, illustrating shafting, bearings, pulleys and gearing.

Lead Batteries.—The Titan Storage Battery Company, Newark, N. J., has issued a booklet describing the construction and action of its lead storage batteries, which are designed for ignition, starting and lighting purposes.

Batteries for Yachts and Power Boats.—Information regarding storage batteries especially adapted for operating apparatus aboard boats is contained in Bulletin No. 147 issued by the Electric Storage Battery Company, Philadelphia, Pa.

Batteries for Locomotives.—The methods of determining the type of battery to be used with a locomotive operating under known conditions are explained in Bulletin No. 146 prepared by the Electric Storage Battery Company, Philadelphia, Pa.

White-Metal-Alloy Die Castings.—The accuracy of white-metal die casting and the facilities of the Doehler Die Casting Company, Court and Ninth Streets, Brooklyn, N. Y., for producing these castings are pointed out in Bulletin No. 105 issued by that company.

Insulated Aluminum Cable.—The British Aluminum Company, Ltd., 109 Queen Victoria Street, London, has prepared an illustrated booklet containing information on the relative cost, construction, installation, scrap value and rating of high-tension and low-tension insulated aluminum cables.

Personal Mention

Mr. Albert Buehler resigned Aug. 10 as superintendent of the municipal electric-lighting plant at St. Mary's, Ohio.

Mr. F. Leslie Foss has been appointed purchasing agent of the Greenfield (Mass.) Electric Light & Power Company.

Mr. H. M. Benson has superseded Mr. H. Morrison as superintendent of the Sioux City (Iowa) Service Company.

Mr. George D. Locke has succeeded Mr. N. W. Fellows as president of the Harrison (Ark.) Electric Light & Ice Company.

Mr. J. F. Pickett has succeeded Mr. C. N. Thielen as manager of the Riceville (Iowa) Electric Light & Power Company.

Mr. G. D. Remer has succeeded Mr. E. A. Huntoon as superintendent of the Dows (Iowa) electric light and power plant.

Mr. A. Holger has been appointed manager of the Rushford (Minn.) Power Company as successor to Mr. C. H. Grieser.

Mr. L. A. Fitts has been appointed chief power plant engineer of the Greenfield (Mass.) Electric Light & Power Company.

Mr. W. P. Berry has succeeded Mr. S. W. Henderson as president of the Lufkin (Tex.) Electric Light & Power Company.

Mr. L. E. Thorne has succeeded Mr. Claude F. Blakeslee as superintendent of the Oakes (Neb.) Light & Power Company.

Mr. L. J. Clark has succeeded Mr. P. D. Rensonhouse as auditor of the Tri-County Light & Power Company, Aledo, Ill.

Mr. F. C. Baldridge has succeeded Mr. J. L. Longino as superintendent of the Merchants' Lighting Company, Little Rock, Ark.

Mr. William H. Redman has succeeded Mr. G. H. Corwin as manager of the municipal electric plant at Greenport, N. Y.

Mr. Bert Lund has succeeded Mr. J. G. W. Johnson as superintendent of the Consumers' Power Company, Stillwater, Minn.

Mr. F. W. Hines has been appointed superintendent of the municipal electric plant, Salem, Ill., as successor to Mr. O. E. Wade.

Mr. H. M. Benson has been appointed superintendent of the Sioux City (Iowa) Service Company as successor to Mr. H. Morrison.

Mr. H. P. Harris has succeeded Mr. C. J. Chapman as superintendent of the Conant-Bryant Power Company, Wilson, N. Y.

Mr. W. Roy Gray has succeeded Mr. D. R. Cowman as manager of the municipal water and electric-light plant at Greenfield, Ohio.

Mr. Charles Burgess has been appointed superintendent of the municipal electric plant at Perry, Kan., as successor to Mr. L. L. Bell.

Mr. Thomas Rhodes, formerly manager of the Consumers' Power Company, New Orleans, La., is now commercial manager of the New Orleans Railway & Light Company, of that city.

Mr. T. W. Siemon, who resigned as treasurer and assistant secretary of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has been elected secretary and treasurer of the Union Switch & Signal Company, Swissvale, Pa.

Mr. Howard S. McNair has been appointed secretary and treasurer of the American Cities Company, New Orleans, La., succeeding Mr. R. E. Slade. Mr. McNair was formerly secretary to President Hugh McCloskey of the New Orleans Railway & Light Company.

Mr. F. O. Dolson, formerly superintendent of construction with the Southern Sierras Power Company, has superseded Mr. D. R. Kennedy as superintendent of generating plants for the Nevada-California Power Company and the Southern Sierras Power Company, Bishop, Cal.

Sir Adam Beck, chairman of the Hydro-Electric Power Commission of Ontario, Canada, and who is also chairman of the Canadian Militia Remount Commission, has offered his services to the Canadian Militia Department and has been called to Ottawa to confer with the government regarding the horse supply for the British army in the present war.

Mr. J. L. Longino, formerly superintendent of the Merchants' Lighting Company, Little Rock, Ark., has become secretary and engineer in charge of construction work for the Arkansas Power Company, Malvern, Ark. This company controls the Arkadelphia (Ark.) Electric Light Company and the Standard Ice & Light Company, Magnolia, Ark.

Mr. Milton Rich, until recently a member of the engineering staff of the Commonwealth Edison Company of Chicago, has resigned to become connected with the Kellogg Toasted Corn Flake Company. Mr. Rich was secretary of the N. E. L. A. section of the company last year and was popular with his associates, who arranged two farewell dinners in his honor at the time of his departure.

Mr. Douglas S. Martin, of the editorial staff of the *Electrical World,* sailed for England Aug. 19 on the Cunarder *Laconia,* preparatory to enlisting in the volunteer service of his native country. Before joining the staff of this paper Mr. Martin was the editor of the *General Electric Review.* He is a brother of Mr. T. C. Martin, formerly editor of the *Electrical World.* and now executive secretary of the National Electric Light Association.

Mr. George Daugherty, until recently manager of the Trumbull Public Service Company, Warren, Ohio, has retired from active service to engage in the real-estate business. Mr. Daugherty was engaged in public utility work for more than twenty-eight years, beginning as foreman of a crew laying gas mains for the Warren Water & Light Company. Later appointed manager, he was retained in that capacity when the company was taken over by the Doherty syndicate in 1911 and renamed the Trumbull Public Service Company. Under the direction of Mr. Daugherty the electric service properties in Warren and the surrounding country were connected by high-tension transmission lines, and practically all of the plants rehabilitated to make a modern system. Within the last year Mr. Daugherty has feared that indoor work was affecting his health, and his resignation has come about from a desire to spend more time out of doors.

Dr. Edward B. Rosa, chief physicist of the United States Bureau of Standards, Washington, D. C., has directed much important work in the absolute measurement of electrical quantities, as well as in the solution of problems in practical electrical engineering. In reviewing the vast array of scientific work done by the electrical division of the bureau under Dr. Rosa's charge, mention may be made of his redetermination of the ratio of the units of electrical measurement, his measurement of the electrochemical equivalent of silver, his invention of methods for measuring capacity and inductance, calculations of the electrical characteristics of coils, specification of the international candle, etc. Dr. Rosa was born in 1861 and in 1886 was graduated from Wesleyan University, receiving the degree of Ph.D. from Johns Hopkins University in 1891. Returning to Wesleyan, he became professor of physics, and meanwhile devised and invented a number of instruments, besides conducting important investigations in dielectric measurements, alternating-current wave-forms, electromagnetic units, etc. Dr. Rosa is a fellow of the A. I. E. E., a former director of the Illuminating Engineering Society and a member of many other scientific organizations. He is a member of the International Electrical Commission and is the honorary secretary of the International Electrical Congress to be held next year at San Francisco.

DR. EDWARD B. ROSA

Construction

New England

WATERVILLE, MAINE.—The Bangs power station of the Central Maine Pwr. Co. was damaged by fire recently, causing a loss of from $30,000 to $40,000.

HOLYOKE, MASS.—The owners of the Germania Mills, it is reported, are contemplating the erection of a new power station and dye house. The power plant is for the woolen and worsted department.

LEOMINSTER, MASS. — Arrangements are being made by the Leominster El. Lt. & Pwr. Co. for extensions to the street-lighting system in Leominster.

WALTHAM, MASS.—The Edison El. Illg. Co. of Boston has submitted a proposition to the Council for replacing the present lamps on Main and Moody Streets with new magnetite arc lamps.

HARRISVILLE, R. I.—The village of Harrisville has entered into a contract with the Pascoag Fire District for street-lighting for a period of three years. The contract provides for the installation of 60 lamps of 60 cp. Electricity for commercial and residential lighting will also be furnished. New transformers will have to be installed and new wire and poles erected.

HARTFORD, CONN.—Bids will be received by the board of contract and supply at the Mayor's office, City Hall, Hartford, until Sept. 8 for lighting the section of the city outside of that covered by the present ornamental lighting system for the period ending June 1, 1919. Plans and specifications can be obtained from the superintendent of streets.

NEW HAVEN, CONN.—The contract for electrical work on the new building of the Broadway Bank & Trust Co., to be erected on Broadway, has been awarded to Herbert I. Lee, of Wallingford.

NEW LONDON, CONN.—The contract for the installation of electric fixtures and electric wiring in the first group of buildings of the Connecticut College for Women has been awarded to the New Engineering Co., of New London. The cost of equipping the first three buildings is estimated at from $8,000 to $10,000.

Middle Atlantic

BATH, N. Y.—Bids will be received by Joseph A. Goulden, president of board of trustees, New York State Soldiers and Sailors' Home, until Sept. 8 for two 125-hp boilers for the New York State Soldiers and Sailors' Home at Bath. Drawings and specifications may be consulted and blank form of proposal may be obtained at the New York State Soldiers and Sailors' Home, Bath, at the Department of Architecture, Capitol, Albany, and at the New York office of the Department of Architecture, Room 1224, Woolworth Building, New York, N. Y. William H. Nichols is secretary.

GLENS FALLS, N. Y.—Bids will be received at the office of Charles E. Bullard, Glens Falls, until Sept. 2, for the general construction and mechanical work, including heating and ventilating, plumbing and electric wiring, of a school building in Glens Falls. Copies of plans and specifications can be obtained at the office of Tooker & Marsh, architects, 101 Park Avenue, New York, N. Y., and at the office of Charles E. Bullard, Glens Falls.

ORWELL, N. Y.—The Public Service Commission has granted the Salmon River Pwr. Co., an operating subsidiary of the Niagara, Lockport & Ontario Pwr. Co., permission to issue $300,000 in bonds, to be sold at not less than 85. Part of the proceeds will be used to complete construction work.

SENECA FALLS, N. Y.—The Seneca Falls Mfg. Co., we are informed, does not contemplate the construction of a power plant as reported in the issue of Aug. 1.

WEST HAVERSTRAW, N. Y.—Bids will be received by George Blasdon, president of board of managers, New York State Hospital for Crippled and Deformed Children, West Haverstraw, until Sept. 5, for construction, heating, plumbing and electrical work for solaria at the New York State Hospital for Crippled and Deformed Children, West Haverstraw. Bids are to be submitted on each division of the work and no combination of bids will be considered. Drawings and specifications may be seen and blank forms of proposal obtained at the hospital, West Haverstraw, at the Department of Architecture, Capitol, Albany, and at the office of Department of Architecture, 1224 Woolworth Building, New York. Lewis F. Pilcher is state architect.

BUTLER, PA.—The West Penn El. Co., it is reported, is contemplating extensive improvements to its plant on Spring Street.

ELLWOOD CITY, PA.—The State Utilities Commission has ruled that the borough of Ellwood City could not enter into a contract with the Harmony El. Co. to supply electricity to the borough and has given its approval of a contract to be made with the Pennsylvania Pwr. Co.

PHILADELPHIA, PA.—The contract for electrical work for the South Philadelphia High School has been awarded to Cates & Shepard, of Philadelphia, at $26,500.

PITTSBURGH, PA.—Bids will be received at the office of the city controller, Municipal Hall, Pittsburgh, for the electric wiring for the two new pavilions and the present cottage buildings at the City Home and Hospital, at Marshalsea Station, Pa. Plans and specifications can be obtained at the office of John P. Brennan, city architect, North Side Municipal Building, corner Ohio and Federal Streets.

PITTSTON, PA.—The ten-year lighting contract between the city of Pittston and the Citizens' El. Illg. Co. has been approved by the Public Service Commission. The contract becomes effective at once and the company, it is understood, will start immediately to install new General Electric lamps.

KEYPORT, N. J.—Preparations are being made by the Middlesex & Monmouth El. Lt., Ht. & Pwr. Co., of Keyport for the erection of a new transmission line to the city pumping plant in Mechanicsville. The company was recently awarded a contract to furnish energy to operate the plant.

PLAINFIELD, N. J.—The Commonwealth Wtr. & Lt. Co. has been awarded a contract by the Warren Township committee for street lighting, which provides for 100 new street lamps, at a cost of $1,700 per year. The company has made application for a 50-year franchise.

TRENTON, N. J.—Bids will be received by the City Commission until Aug. 28 for electric wiring for power and light at the filtration plant and for changes in the electric-lighting system at the pumping station. Plans and specifications are on file in the office of the engineer at the filter plant.

RIDGELY, MD.—Contract has been awarded by the St. Gertrude's Academy to the McIver Construction Co., Law Building, Baltimore, for the erection of chapel, three stories (89 ft. by 200 ft.), academy building (four stories, 72 ft. by 144 ft.) and power house.

FAIRMONT, W. VA.—Contracts have been awarded by the Monongahela Valley Trac. Co., of Fairmont, it is reported, for equipment and machinery for its power house to be erected at Hutchinson, at a cost of about $300,000. The equipment includes four 250-hp gas engines. The company's plant at Jayenne will be abandoned, owing to acid in the waters of the West Fork River.

FAYETTE, W. VA.—Preparations are being made by the Fayette & Fayetteville Trac. Co. for the construction of a power plant and other details in connection with the completion of its proposed electric railway between Fayette and Fayetteville, for which $50,000 in bonds were recently authorized.

MORGANTOWN, W. VA.—Bids will be received by the board of education of Morgantown until Sept. 8 for construction of high school building in accordance with plans and specifications prepared by C. W. Bates, architect, Wheeling. Separate bids to be submitted for general contract, heating, plumbing and wiring. Plans and specifications may be seen at the office of the architect and at the office of the superintendent in Morgantown. W. S. John is secretary of board.

WHEELING, W. VA.—A permit has been granted to the Wheeling Trac. Co. for the erection of a new power plant at Water and Forty-first Streets to cost about $260,000. J. M. Hopwood, electrical engineer, will have charge of the work.

CLARKSVILLE, VA.—The installation of an electric-light plant (to cost from $5,000 to $10,000) in Clarksville is reported to be under consideration. The lighting committee would like to receive estimates on equipment, including gas producers, oil or steam power.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Sept. 1, for 1000 cross-arms, complete for iron poles, under Proposal 718.

North Central

DETROIT, MICH.—The power plant of the Hotel Tuller, it is understood, is to be enlarged. An addition (containing more than 300 rooms) has been erected to the hotel.

LAPEER, MICH.—The Lapeer Gas-Electric Co. is planning to install a steam-heating system. Exhaust steam from the electric-light plant will be used.

YPSILANTI, MICH.—The Peninsular Paper Co. has begun work on the construction of a large power plant at its mills on the Huron River, about 1 mile north of the city.

CANTON, OHIO.—The City Council has voted to replace 55 street arc lamps with 250-cp nitrogen lamps, with the understanding that if they are not satisfactory at the end of six months the Canton Gas & El. Co. will replace the arc lamps.

CINCINNATI, OHIO.—Bids will be received by the new court house commission of Hamilton County until Sept. 1 for heating and ventilating, elevator equipment and a power plant for the new court house and county jail. Rankin, Kellogg & Crane, 1012 Walnut Street, Philadelphia, Pa., are the architects; James A. Green is president of the board of building commissioners.

DAYTON, OHIO.—The Dayton Pwr. & Ltg. Co. has secured contracts for street-lighting in New Carlisle, Fairfield and Osborn. The main transmission lines will be tapped at Shoup's Station. In New Carlisle 50 street lamps will be furnished, 60 street lamps in Osborn and 12 street lamps in Fairfield. Electricity for commercial and residential lighting will be supplied. The company has also secured a franchise to supply electrical service in Bowersville. A transmission line will be erected from Xenia to Wilmington.

LOVELAND, OHIO.—The Loveland Lt. & Wtr. Co., recently incorporated with a capital stock of $50,000 will take over the water and light plant in Loveland. The new company, it is understood, proposes to make improvements to the plant and distributing system. The incorporators are Stanley Matthews, J. A. Bethtel and others.

PEMBERVILLE, OHIO. — Owing to Bushman Brothers, owners of the local electric-light plant, having decided to close down their plant Oct. 1, the Council will advertise for bids for lighting the streets of the town.

YOUNGSTOWN, OHIO.—Bids will be received by the clerk of board of education, 20 West Wood Street, Youngstown, until Aug. 24 for vacuum cleaning system for the Washington Tod Memorial and Lansingville buildings.

BOWLING GREEN, KY.—The Kentucky Pub. Ser. Co. has erected 41 nitrogen lamps in the central part of the city. These lamps replace the old arc lamps and will be used throughout the city as soon as the change can be made. The City Council has voted to abandon the municipal electric-light plant and has contracted with the Kentucky Pub. Ser. Co. to light the streets of the city.

EVANSVILLE, IND.—Negotiations are under way between the City Council and the Evansville Public Ser. Co. for a new street-lighting contract to go into effect Aug. 15, 1915, which provides for a complete new street-lighting system. The company, it is understood, contemplates the installation of a new 5000-kw turbine and other equipment, including four new boilers of 600 hp, next spring. A. C. Blinn is president and manager of the Evansville Public Ser Co.

HUNTINGTON, IND.—Bids will be received by the Board of Public Works of Huntington, at the office of the city clerk, until Aug. 31 for furnishing the following equipment for the municipal electric-light and water-works plant: One high-duty flywheel pumping engine, condenser for pumping unit, one turbine generator, condenser for generating unit, two water-tube boilers, one feed-water heater, one stack, one switchboard, one engine-driven generator, and transformers and lamps for lighting equipment, in accordance with plans and specifications on file in the office of the city clerk. Instructions to bidders, specifications and blank proposals may be obtained from the city clerk, or from Charles Brossman, consulting engineer, Merchants' Bank Building, Indianapolis, Ind. H. I. Young is city clerk.

SOUTH BEND, IND.—The Indiana & Michigan El. Co., of South Bend, has applied to the Public Service Commission for permission to issue $150,000 in bonds.

ATWOOD, ILL.—The installation of a municipal electric-light plant in Atwood is under consideration.

CHICAGO HEIGHTS, ILL.—Preparations are being made by the Chicago & Southern Trac. Co. for the construction of a new power house in Chicago Heights.

PRAIRIE DU ROCHER, ILL.—The city of Prairie du Rocher is considering the question of installing a municipal electric-

light plant, to cost about $20,000. C. F. Phillips, Liggett Building, St. Louis, Mo., is consulting engineer.

VIOLA, WIS.—Within the next 30 days the Viola Lt. & Pwr. Co. expects to purchase a switchboard, recording wattmeter, one portable recording voltmeter, one portable stranded wattmeter and one voltage regulator. C. H. Smith is superintendent.

ALBANY, MINN.—The contract for construction of power house has been awarded of John A. Mertz, of New Albany, at $2,986.

MILROY, MINN.—J. W. Dysart, of Milroy, who has recently installed a 60-volt storage-battery plant, would like to receive prices on electrical supplies, including 60-volt watt-hour meters, fans, irons, etc.

OWATONNA, MINN.—The State Board of Control, it is reported, has awarded the contract for heating, plumbing and lighting the State Public School in Owatonna to the Clefton Co., of Owatonna, for $16,467.

ST. PAUL, MINN.—Victor H. Paul, director of the testing laboratories, has recommended the installation of 20 ornamental standards and lamps on the Earl Street bridge.

WESTBROOK, MINN.—Bids will be received by P. G. Hiebert, secretary of the Westbrook El. Lt. & Pwr. Co., of Westbrook, until Aug. 25 for construction of electric-lighting system as follows: (1) For furnishing and installing one 37½-kva, three-phase, 60-cycle, 1200-r.p.m. alternator with belted exciter, switchboard, etc.; (2) for furnishing and erecting poles, wires, street lamps, etc., for electrical distribution system in the village of Westbrook; (3) for furnishing, but not erecting, material for electrical distribution system. Separate bids must be submitted on each division of the work. Plans and specifications are on file in the office of the secretary at Westbrook, and also at the office of Earle D. Jackson, consulting engineer, Capital Bank Building, St. Paul, Minn.

ARLINGTON, IA.—C. Miller, of the Turkey River Pwr. & Lt. Co., of Clermont, is negotiating with the City Council for franchise to furnish electricity in Arlington.

DAYTON, IA.—At an election held recently the proposal to grant a franchise to the Central Lt. & Pwr. Co., of Boone, to install an electric-light system in Dayton was carried.

LAMOILLE, IA.—Bids will be received by John Huff, president of the Independent and Consolidated School District of Lamoille until Sept. 1 for erection of a two-story school building. Separate bids to be submitted for heating, plumbing and electric wiring.

MANCHESTER, IA.—The contract for construction of a new cement dam at the Quaker Mills has been let by Joseph Hutchinson. The new dam, it is understood, will furnish power to operate an electric-light plant which Mr. Hutchinson proposes to install in the near future.

GLADSTONE, MO.—Plans are being prepared by Tuttle & Pike, Kansas City, Mo., for the erection of an electric transmission line from Gladstone to Armstrong. Bids for construction work will soon be asked for.

HOPKINS, MO.—The Hopkins El. Lt. & Ice Co. is installing an electric-light plant. The equipment will consist of a 60-hp to 70-hp crude-oil engine, one 50-kw, three-phase, 2300-volt generator, switchboard, about seven transformers (3 kw to 10 kw). About 10 miles of wire and 400 cedar poles will be required for overhead distribution system. About 100 meters will be installed at first. Contracts have been placed for all material except for street-lighting system and meters. G. D. Henderson, of Hopkins, is engineer in charge.

MARMARTH, N. D.—Steps have been taken by local business men to organize a company to construct and operate an electric-light plant. Application has been made to the Village Board for a franchise.

PARKER, S. D.—Bids will be received by the city of Parker until Sept. 4 for furnishing material and labor for extensions to water-works system and construction of new electric-light plant as follows: (1) For extensions to water-works distribution system, with all accessories installed complete; (3) construction of power station for electric-light plant with all accessories; (4) furnishing and installing oil engines, auxiliary apparatus, etc.; (5) generators, exciters, switchboard, motor for pump, etc.; (6) material and erecting pole line and wiring, street-lighting system, together with all accessories, in accordance with plans and specifications prepared by J. F. Druar, engineer, of the Oscar Claussen Engineering Co., Commercial Building, St. Paul, Minn., which may be seen at the office of the engineer or at the office of C. L. Jones, city auditor, Parker.

NORTH BEND, NEB.—Bonds to the amount of $37,000 for the installation of a municipal electric-light plant and sewer system were voted at the election held Aug. 7.

ALTON, KAN.—The City Council is reported to have awarded the contract for the construction of a combined water and light plant to the Commercial Construction Co., of Kansas City, Mo., at $20,018. Rollins & Westover, Midland Building, Kansas City, are engineers.

TOPEKA, KAN.—The city of Topeka is planning to install a 250-kva, 60-cycle, three-phase, 2300-volt turbo-alternator with exciter (directly connected) in the municipal electric-light plant. Contract will probably be awarded about Oct. 1. E. G. Stahl is superintendent.

WINFIELD, KAN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 3 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office at Winfield, Kan. Drawings and specifications may be obtained at the above office or from the custodian of site at Winfield. O. Wenderoth is supervising architect.

Southern States

RALEIGH, N. C.—The installation of an ornamental street-lighting system in the business section is under consideration.

AUGUSTA, GA.—Bids will be received by the special hospital building committee of the City Council of Augusta, until Sept. 1, for furnishing and installing X-ray apparatus at the University Hospitals in Augusta. Specifications may be obtained on application to W. C. Lyle, M.D., vice-dean.

ROCKMART, GA.—Preparations are being made for the installation of a 125-kw alternating-current generator and a four-valve automatic, non-condensing engine (directly connected) and one-panel switchboard in the municipal electric-light plant, work on which will begin about Sept. 1. J. B. Cooper is superintendent.

APOKA, FLA.—At an election held recently the proposal to issue $15,000 in bonds for the installation of a municipal electric-light plant was defeated.

JACKSONVILLE, FLA.—Bids will be received by the Board of Bond Trustees of the city of Jacksonville until Sept. 4 for furnishing 1000, more or less, induction recording wattmeters, both single-phase and multi-phase, for 110 volts or 220 volts, 60 cycles, on the basis of future delivery, meters to be shipped by month as needed. For further information apply to R. N. Ellis, purchasing agent, City Hall, Jacksonville.

CHATTANOOGA, TENN. — Extensive changes are being made in the hydroelectric plant of the Chattanooga & Tennessee River Pwr. Co. at Hale's Bar in the Tennessee River to enable connection to be made between its transmission lines and those of the Tennessee Pwr. Co., a subsidiary of the Tennessee Ry., Lt. & Pwr. Co. The voltage of the Hale's Bar plant is being raised from 40,000 volts to 120,000 volts, the same as used on the transmission lines of the Tennessee Pwr. Co.

JACKSON, TENN.—Beare Brothers Ice & Coal Co., of Jackson, it is reported, would like to receive estimates on two electric generators.

BAY MINETTE, ALA.—Bids, it is reported, will be received by the city of Bay Minette for the construction of an electric-light plant and water-works system. A bond issue of $5,000 was recently voted for electric plant and $14,000 for water-works system. Edgar B. Kay, of Tuscaloosa, is consulting engineer.

GLENWOOD, ARK.—John H. Pedan, of Hot Springs, recently granted a franchise to install an electric-light plant in Glenwood, will begin work at once on installation of same.

ARDMORE, OKLA.—The Ardmore Ice, Lt. & Pwr. Co., it is reported, contemplates the construction of an electric-light plant and ice factory in Ringling. H. E. Foster is manager.

McALESTER, OKLA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 4 for the installation of an electric elevator in the United States post office and court house at McAlester, in accordance with plans and specifications copies of which may be obtained at the above office. O. Wenderoth is supervising architect.

TULSA, OKLA.—Bids will be received at the office of the Young Men's Christian Association, 333 Iowa Building, Tulsa, until Sept. 7 for heating, plumbing and electric wiring for the Young Men's Christian Association Building, Tulsa. Drawings and specifications may be secured at the above office. C. E. Buchner is secretary.

BRYAN, TEX.—The City Council has granted O. E. Gammill permission to install an electric power plant for the Bryan-College Interurban railway, but refused him the right to sell electricity within the city limits.

DALLAS, TEX.—The Board of City Commissioners have decided to install an electric elevator in the new city hall, instead of a hydraulic lift as planned.

LAMPASAS, TEX.—The Lampasas Lt. & Pwr. Co. is contemplating installing a 50-kw generator about Jan. 15, 1915. Emil Haby is owner and manager.

LA PORTE, TEX.—The La Porte Wtr., Lt. & Ice Co. expects to purchase within the next nine months one 15-ton ice plant and two 75-hp crude-oil engines, and to erect 3 miles of transmission lines, two 50,000-gal. water towers and tanks, and install water mains, etc. Philip J. Pfeifer is president.

PARIS, TEX.—The Texas Pwr. & Lt. Co. has begun work on the erection of a new electric power plant on its property adjoining the new gas plant. The equipment will consist of three 500-hp Diesel oil engines, generators, switchboards, etc. The plant when completed will furnish electricity in Paris and to towns between here and Bonham, and probably in other directions. The company, it is understood, will rebuild its local lines. Contracts have been awarded for construction of building and equipment. W. G. Moore is local manager.

UVALDE, TEX.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 6 for construction complete, including mechanical equipment, lighting fixtures and approaches, of the United States post office in Uvalde. Drawings and specifications may be obtained from the above office or from the custodian of site at Uvalde. O. Wenderoth is supervising architect.

WACO, TEX.—The Brazos Valley Teleg. & Tel. Co. is planning to erect a telephone exchange building in Waco, to cost from $75,000 to $100,000, and also to rebuild its wires and cables.

Pacific States

PE ELL, WASH.—Arrangements are being made by the Centralia Lt. & Pwr. Co. for the construction of a new dam near Pe Ell, to cost about $20,000. The company, it is understood, also contemplates improvements and additions to its local plant. The main office of the company is in Centralia, Wash.

CORVALLIS, ORE.—The local substation of the Oregon Pwr. Co. was recently damaged by fire, causing a loss of about $5,000. A large generator, it is understood, was destroyed.

PORTLAND, ORE.—The Portland Ry., Lt. & Pwr. Co. has awarded the contract for the direction of a transmission line from Sandy to Bull Run to F. L. Mack, of Portland. The company was recently granted a franchise to supply electricity in Sandy.

SUMMERVILLE, ORE.—The Kleiss El. Co. has filed application for water rights on Milk Creek, a tributary of the Grande Ronde River, sufficient to develop 200 hp. The company, it is understood, proposes to furnish electricity in Summerville.

LOS ANGELES, CAL.—The City Council has instructed City Electrician Manahan to take steps at once to provide additional lamps for Echo Park and other parks in the city.

PETALUMA, CAL.—The City Council has decided to issue $10,000 in bonds for electroliers. An election will be called some time in September to submit the proposal to the voters.

SAN FERNANDO, CAL.—The San Fernando Tel. & Teleg. Co., recently incorporated with a capital stock of $50,000, will take over the telephone system and franchise of the Consol. Securities Co. The system will be almost entirely rebuilt. Under the new franchise metallic circuits must be installed.

SAN FRANCISCO, CAL.—Steps have been taken by the Fourth and Fifth Streets Improvement Club for the installation of ornamental street lamps on Fourth Street from Market Street to Townsend Street. The present plans provide for 95 lamps. The club has also decided to petition the Board of Supervisors to extend the Stockton Street municipal car line along Fourth Street to Townsend Street.

SALT LAKE CITY, UTAH.—The City Commission has granted the Dooly Building Pwr. Co. a franchise to supply electricity and steam heat in this city. The franchise is limited to the territory between North Temple Street, Fifth South Street, Second East Street and First West Street.

TEMPE, ARIZ.—L. G. Knipe, consulting engineer, of Phoenix, has been engaged by the City Council to prepare plans for the installation of a municipal electric light and power plant in Tempe.

TOLCHACO, ARIZ. — Application has been made to the United States Land Office at Phoenix by F. G. Baum, engineer, 1404 Chronicle Building, San Francisco, Cal., for a permit to utilize the water-power of the Little Colorado River. The company proposes to erect two dams on the river near Tolchaco and to build hydroelectric power plants and erect a 175-mile transmission line to Globe, Ray and Hayden.

PUEBLO, COL.—The Arkansas Valley Ry. & Pwr. Co., of Pueblo, has closed a contract with the Vindicator Consol. Gold Mining Co., covering 285 hp in motors for operating an air compressor, which will be operated 16 hours a day.

CARSON CITY, NEV.—Preparations are being made by the Canyon Pwr. Co. of California, which has leased the government hydroelectric power plant at Lahontan, for making surveys for the erection of a transmission line from the Lahontan plant to Hazen and Lovelock and thence to Rochester, a distance of 100 miles. The company purposes to furnish electricity to the mining interests and other industries in that territory. W. H. Leffingwell is chief enginner.

Canada

CALGARY, ALTA.—Plans, it is reported, have been prepared by Theodore Kipp, Union Trust Building, Winnipeg, for the construction of a power house for the Western Canada Flour Mills, Ltd.

ST. JOHN, N. B.—The New Brunswick Hydro-Electric Co. has applied to the provincial government for permission to issue $10,000,000 in bonds.

NEW GLASGOW, N. S.—The Canadian Provincial Pwr. Co., of New Glasgow, recently incorporated, is contemplating the construction of a power plant on the East River at Sheet Harbor and the erection of transmission lines (aggregating 42 miles) to serve the towns of New Glasgow, Stellarton, Westville and Trenton.

BELLEVILLE, ONT.—At an election held Aug. 3 the ratepayers voted to confirm the agreement between the city and the Trenton El. & Wtw. Co. for lighting the city.

PORT ARTHUR, ONT.—Work has commenced on the transformer station to be erected in the east city limits by Oliver & Edwards, to cost $10,074. Transformers and lightning arresters, it is reported, will be required. L. M. Jones is engineer.

WALKERVILLE, ONT. — The Hydro-Electric Power Commission of Ontario is reported to have purchased the plant and property of the Walkerville Lt. & Pwr. Co., at $84,500. The property will be taken over at once and operated by the commission until the Hydro-Electric lines are extended to Walkerville, which will be very soon.

MOOSE JAW, SASK.—Bids will be received by J. D. Peters, electrical superintendent, for high-pressure steam pipe for a 3500-hp. plant for the city.

New Incorporations

BURKESVILLE, KY.—The Burkesville Lt. & Pwr. Co. has been chartered with a capital stock of $2,000 by J. P. Smith, C. W. Alexander, D. McComas and George Greenup.

MANISTIQUE, MICH.—The Schoolcraft County Pwr. Co. has been incorporated with a capital stock of $5,000 to develop the water-power of the Manistique River.

MONROE, MICH.—The River Rasin Hydro-Electric Co. has been incorporated with a capital stock of $75,000 to develop water-power on the River Rasin.

NEW LEBANON, N. Y.—The Lebanon Valley Ltg. Co. has been chartered with a capital stock of $10,000, by F. W. Munch, of Dalton, Mass.; M. L. Munch, of Indian Orchard, Mass., and H. W. Munch, of Binghamton, N. Y. The company proposes to generate and distribute electricity for lamps, heaters and motors in Lebanon Springs, New Lebanon and West Lebanon.

POMEROY, OHIO.—The Ohio River El. Ry. & Pwr. Co., of Pomeroy, has been incorporated with a capital stock of $10,000 to build an electric railroad. The incorporators are: I. L. Oppenheimer, J. W. Wolfe, D. W. Hennesey, George Wanger and W. H. Plantez.

HARRISBURGH, PA.—Charters have been granted for four electric companies, which will take the names of the districts where they are to operate as follows: Greene Township Lt. Co., Greene Township; Hanover Lt. Co., Hanover Township; Raccoon Township Lt. Co., Raccoon Township, and Independence Lt. Co., Independence Township. Each company will be capitalized at $5,000 and the offices will be at New Brighton. The incorporators are A. W. Stevenson, A. W. Robertson, J. R. McNary, E. W. Washabaugh and L. F. Kane, of Pittsburgh.

HARRISBURG, PA.—Charters have been granted by the State Department to the following electric-light companies: The Hellertown, Bethlehem Township and Freemansburg El. Lt. & Pwr. companies; each company is capitalized at $5,000 and takes its name from the district it is to operate in; Charles N. Wagner, of Allentown, is treasurer. Also to the Turbotville, Lewis Township and McEwensville El. companies, with offices in Sunbury; the companies are capitalized at $5,000 each; L. K. Bingen, of Sunbury, is treasurer. Also to the East Tayler Township Pub. Ser. Co., with a capital stock of $5,000; H. E. Thompson, of Johnstown, is treasurer.

NEW HOLLAND, PA.—The New Holland El. Co. has been granted a charter with a capital stock of $5,000 to supply electricity for lamps and motors in New Holland and vicinity. The incorporators are John S. Galt, treasurer; S. R. Zimmerman and J. Guy Eshelman.

WEST DEER, PA.—The West Deer Township El. Co. has been granted a charter with a capital stock of $5,000 to operate an electric plant in West Deer Township, Allegheny County, with office in Pittsburgh. The incorporators are J. C. Dicey, W. O. Grueneisen and R. E. Vokach, of Pittsburgh.

SALT LAKE CITY, UTAH.—The Salt Lake Lt. & Trac. Co. has been incorporated with a capital stock of $1,000,000 to operate electric, gas and steam plants. The incorporators are O. J. Salisbury, S. A. Whitney, C. W. Johnson, A. H. Parsons and J. B. Salisbury.

MONTELLO, WIS.—The Montello & Harrisville El. Lt. & Pwr. Co. has been incorporated with a capital stock of $40,000 by D. W. McNamara, L. M. McNamara, L. G. Miller and others.

PEACE RIVER CROSSING, ALTA.—The Peace Valley Lt. & Pwr. Co. has been incorporated with a capital stock of $50,000.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED AUG. 11, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,106,368. ELECTRICAL APPARATUS; F. Conrad, Swissvale, Pa. App. filed April 10, 1908. Current rectifier and regulator which can be readily removed from its casing.

1,106,372. AUTOMATICALLY OPERATED SWITCH; C. W. Eisenmann, Chicago, Ill. App. filed July 1, 1912. Prevents closing of a circuit between storage battery and dynamo at any time when voltage of dynamo is less than that of battery.

1,106,381. ELECTRODE FOR FURNACES; C. Hering, Philadelphia, Pa. App. filed Dec. 12, 1912. In form of shell or cage so thin that the current flows through practically its entire section.

1,106,384. INCANDESCENT BODY FOR ELECTRIC LAMPS; W. S. Hughes, Pittsburgh, Pa. App. filed Dec. 16, 1912. Drawn uranium in pure metallic state.

1,106,386. FUEL VAPORIZER FOR EXPLOSION ENGINES; H. H. and C. B. Ingersoll, Chicago, Ill. App. filed Nov. 3, 1910. Obliquely disposed on edge resistance ribbon placed in engine intake.

1,106,387. RAIL CONTACT FOR VEHICLES; E. Jenoi and J. Stevenson, Jenkins, Ky. App. filed May 15, 1913. Contact rollers mounted on a spring-pressed slide.

1,106,432. IGNITION SYSTEM; E. C. Wilcox, Meriden, Conn. App. filed May 10, 1913. Battery automatically cut out of circuit when engine stops on a contact point.

1,106,436. ELECTROLYTIC MANUFACTURE OF ALKALI METALS; C. A. Ashcroft, London, Eng. App. filed May 23, 1914. Electrolyte containing alkali hydroxide and alkali cyanide.

1,106,441. SIGNALING MECHANISM; H. C. Crumrine, Cleveland, Ohio. App. filed July 5, 1912. Auto rear signal.

1,106,442. ELECTRIC PLUG; F. Deiser, Chicago, Ill. App. filed Oct. 24, 1911. "Swivel" attachment plug.

1,106,459. LAMP SOCKET; G. C. Krauff, Chicago, Ill. App. filed Jan. 13, 1913. Bayonet-slot type for auto lamps.

1,106,469. AUTOMATIC MOTOR CONTROL; W. S. Mitchell, Somerville, Mass. App. filed April 17, 1912. Embodies control magnets with switch-operating and switch-holding coils.

1,106,476. ELECTRIC SOLDERING IRON; J. C. Royce, Toronto, Canada. App. filed May 23, 1913. Has flat heating elements clamped to a core of high heat conductivity.

1,106,486. ELECTRIC FURNACE; G. H. Benjamin, New York, N. Y. App. filed Dec. 19, 1913. Secondary in form of annular crucible and body of metal therein can be rotated relative to the core and primary.

1,106,501. CALL REGISTERING TELEPHONE; E. D. Fader, J. Tibb and J. N. Tibb, Vancouver, B. C. App. filed Sept. 19, 1913. After a certain number of calls has been made telephone is automatically disconnected.

1,106,510. ELECTRICAL SYSTEM OF DISTRIBUTION; A. S. Hubbard, Belleville, N. J. App. filed Aug. 7, 1909. Converting apparatus and a booster which is controlled to cause a battery discharge fluctuatingly.

1,106,513. ELECTRIC MOTOR; D. C. Jackson, Madison, Wis. App. filed March 10, 1900. Produces a repulsion motor torque and an induction motor torque simultaneously in the same conductors.

1,106,514. DYNAMO-ELECTRIC MACHINE; D. C. Jackson, Madison, Wis. App. filed Dec. 22, 1902. Alternating-current motor with commutated armature circuit.

1,106,540. RENEWAL ELEMENT FOR SEMI-DRY-CELL BATTERIES; W. Broad, Beaver Falls, Pa. App. filed April 17, 1913. Cake of manganese dioxide and carbon impregnated with chemicals of excitant nature.

1,106,572. INSULATING JOINT FOR PIPE SYSTEMS; A. J. Loepsinger, Providence, R. I. App. filed Aug. 28, 1911. For dry-pipe automatic sprinkler systems.

1,106,576. ELECTROMECHANICAL SWITCH; R. R. Miller, Pueblo, Col. App. filed Dec. 2, 1911. Solenoid mechanical switch-throwing connections.

1,106,592. TELEPHONE SYSTEM; F. E. Summers, Memphis, Mo. App. filed June 22, 1912. Subscriber can ring or talk in one direction only or in both.

1,106,593. ELECTRIC SWITCH; B. P. Swyers, Pittsburgh, Pa. App. filed Sept. 17, 1912. Permutation switch for auto-ignition circuits.

1,106,631. INVERTED LAMP; W. J. Davis, Jr., Chicago, Ill. App. filed Nov. 17, 1913. Shaded light for cleaning floors, etc.

1,106,639. MOTOR SWITCH; O. B. Duncan, Chicago, Ill. App. filed May 6, 1912. Has a quick throw to change from starting to running connections.

1,106,655. TELEPHONE CALL BELL OR RINGER; W. Raisling, Chicago, Ill. App. filed Aug. 10, 1906. A magnet yieldingly holds the armature in its "biased" position.

1,106,680. SUBSTATION SIGNAL RECEIVING DEVICE; H. O. Rugh, Sandwich, Ill. App. filed Jan. 20, 1911. Step-by-step selective signaling device.

1,106,683. ELECTRIC WEB-DRYING MACHINE; J. C. Sherman, Brookline, Mass. App. filed April 29, 1911. Primary or non-rotatable core and secondary in form of rotary tubular drum.

1,106,710. RECORDING ELECTRIC METER; C. H. Ingalls, Danvers, Mass. App. filed Aug. 12, 1910. Registering portion can be used with standard integrating meter.

1,106,719. BATTERY; S. Lake, Milford, Conn. App. filed Aug. 6, 1912. Special storage-battery construction for submarine boats.

1,106,750. TELEGRAPH SYSTEM; B. F. Thompson, Arlington, Md. App. filed Dec. 22, 1910. Single, duplex or diplex; balancing of line is eliminated.

1,106,761. SELF-LOCKING JUNCTION BOX COUPLING; A. W. Weikert and J. Pettibone, Washington, D. C. App. filed Feb. 6, 1914. Conductor clamp with spring fingers interlocking with the junction box.

1,106,762. ELECTRIC WRITING TELEGRAPH; E. H. Widegren and R. A. Widegren, Alby, Sweden. App. filed Dec. 20, 1913. Springs are interposed in the connections between the electromagnetic devices and the recording pen.

1,106,789. ARC LAMP; H. E. Davies, West New York, N. J. App. filed April 12, 1910. Special electrode feed mechanism.

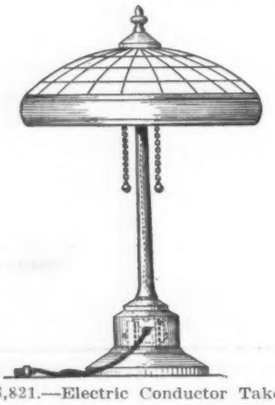
1,106,797. ELECTRIC INSULATOR; J. L. Fay, St. Louis, Mo., and S. B. Way, Milwaukee, Wis. App. filed Feb. 24, 1913. Induces a circulation of air to dissipate the heat produced by "flashovers."

1,106,799. SCALE; W. N. Gilbert, Springfield, Ohio. App. filed Dec. 19, 1910. Platform scale with two indicators.

1,106,819. PLAYING APPARATUS FOR MUSICAL INSTRUMENTS; J. F. Kelly, Pittsfield, Mass. App. filed Dec. 6, 1907. Player piano with special provision for accenting desired notes.

1,106,821. ELECTRIC CONDUCTOR TAKE-UP; D. C. Lamb. Nappanee, Ind. App. filed Dec. 4, 1913. Cord reel mounted in the base of the lamp or other device.

1,106,823. TROLLEY GUARD; J. Lawton, Irvington, N. J. App. filed April 10, 1912. Freely swinging guard arms at sides of trolley wheel.



1,106,821.—Electric Conductor Take-up

1,106,828. PORTABLE ELECTRIC LAMP; W. J. Monaghan, Waterbury, Conn. App. filed April 6, 1914. Push-button at one end of lamp casing serves to push the battery into contact with the lamp.

1,106,855. WIRE CONNECTOR; G. S. Wills, Twin Buttes, Ariz. App. filed Sept. 14, 1912. Screw plug forces clamp against wire inserted in the casing.

1,106,874. WIRELESS APPARATUS; P. L. Jensen, San Francisco, Cal. App. filed June 4, 1912. Eliminates the effect of atmospheric electricity.

1,106,875. WIRELESS APPARATUS. P. L. Jensen and E. S. Pridham, Napa, Cal. App. filed April 22, 1913. Reduces disturbing effects of static electricity by surrounding the antenna with locally charged guard wires.

1,106,907. ELECTRIC CONTACT MAKER FOR FLOW METERS; J. Wilkinson, Schenectady, N. Y. App. filed Jan. 2, 1914. Indicating circuits made by the flowing together of two bodies of mercury.

1,106,911. PROTECTOR; J. Zwilling, New York, N. Y. App. filed May 8, 1914. For protection from lightning; special construction of circuit-connecting springs and their mounting on the base.

1,106,922. SELECTOR; A. M. Bullard, New York, N. Y. App. filed May 3, 1907. The retaining and slipping pawls are both normally out of engagement with the ratchet.

1,106,945. ANTENNA FOR WIRELESS TELEGRAPHY; N. J. Jeffries, Atlantic City, N. J. App. filed May 8, 1913. Made up in collapsible form.

1,106,953. SPARK-CONTROLLING DEVICE FOR MAGNETO IGNITION; H. H. Lanning, Topeka, Kan. App. filed April 5, 1911. Differential gear set interposed in the gearing between the crank shaft and magneto armature.

1,106,960. ELECTRIC GLOW-LAMP; W. Nernst, Göttingen, Germany. App. filed March 29, 1898. Glower consisting of an intimate mixture of yttria and small proportion of tungstic acid.

1,106,961. ELECTRIC GLOW-LAMP; W. Nernst, Göttingen, Germany. App. filed March 29, 1898. Radiant body comprising intimately mixed calcium and tungsten.

1,106,971. FILAMENT MOUNTING; H. C. G. Remane, Berlin, Germany. App. filed Sept. 13, 1910. Anchor has an open S-shaped fork to receive the filament.

1,106,974. LAMP SOCKET; G. F. Rush, Chicago, Ill. App. filed June 13, 1913. Screw shell has teeth frictionally gripping the walls of the base in which it is inserted.

1,106,975. ELECTRIC HEATER FOR FANS; A. Schaeffer, Frankfort-on-the-Main, Germany. App. filed April 8, 1912. Removable heater elements mounted in the fan casing.

1,106,982. AUTOMOBILE REAR SIGNAL; J. W. Stachnick, Baltimore, Md. App. filed June 12, 1913. Automatically indicates by semaphore arm and by lights the direction the auto is to take.

1,107,000. SHORT-CIRCUITING ATTACHMENT FOR GAS-ENGINE IGNITERS; C. N. Weeks and H. N. Jackson, Babylon, N. Y. App. filed Dec. 1, 1911. Pivoted spring jaws forming connection from spark-plug terminal to a ground on the engine.

1,107,013. CIRCUIT CLOSER; A. G. Anderson, Clay Center, Neb. App. filed Oct. 30, 1913. For lighting gas head-lights on autos.

1,107,024. TELEPHONE; L. S. and O. B. Boyce, Rockwell City, Ia. App. filed May 6, 1913. Subscriber on party line can listen without being heard or can push button and then be heard.

1,107,040. REVOLVER FLASHLIGHT; J. R. Conde, Philadelphia, Pa. App. filed March 13, 1914. Attachment which can be quickly clamped to the barrel of a revolver.

1,107,061. ARC LAMP; C. A. B. Halvorson, Jr., Lynn, Mass. App. filed July 21, 1910. Luminous arc; has means to break forcibly the non-conducting layer at the arcing end of the consuming electrode.

1,107,084. VENT AND OVERFLOW FOR BATTERIES; C. T. Mason, Sumter, S. C. App. filed Aug. 21, 1913. For storage cells.

1,107,099. ROTARY ELECTRIC SWITCH; M. R. Ownbey, Shawnee, Okla. App. filed April 7, 1913. Gang switch for electric signs.

1,107,111. INSULATOR; B. S. Purkey, Tacoma, Wash. App. filed Oct. 1, 1912. A spring clip holds the live wire in the slot receiving the same.

1,107,120. PLURAL SOCKET; F. E. Seeley, Bridgeport, Conn. App. filed Nov. 21, 1912. Twin socket with pull-switch control.

1,107,127. ELECTRIC ACTION FOR ORGANS; J. T. Austin, Hartford, Conn. App. filed Dec. 30, 1907. Flexible contacts are bent into engagement with a movable conductor.

1,107,133. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed March 27, 1905. Semi-automatic with common battery at central office.

1,107,134. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed March 27, 1905. Calling subscriber has control of the ringing key.

1,107,135. TELEPHONE EXCHANGE SYSTEM AND APPARATUS; E. E. Clement, Washington, D. C. App. filed July 11, 1905. Semi-automatic, two-wire metallic circuit, with quick-working magnets and slow-control magnets.

1,107,136. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Aug. 5, 1905. Simplified exchange switchboard and uniform distribution of load among the operators or connective apparatus.

1,107,137. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Aug. 31, 1905. Semi-automatic.

1,107,138. AUTOMATIC TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Sept. 18, 1905. Subscriber's sender reduced to simplest form, a simple make-and-break being all that is used.

1,107,139. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Nov. 11, 1905. Has automatic answering and connecting devices controlled by a calling subscriber.

1,107,140. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Nov. 21, 1905. Subscriber can, by a "sender" at his substation, connect his line with the line of any other subscriber.

1,107,141. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Nov. 21, 1905. Auxiliary switchboard during busy hours takes care of overflow from main switchboard and during quiet hours takes entire load.

1,107,142. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Dec. 23, 1905. Semi-automatic.

1,107,143. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed March 15, 1906. Operator gets wanted number from subscriber and then simply presses proper button.

1,107,144. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed March 30, 1906. Semi-automatic with special connector switch mechanism. (Forty-nine claims.)

1,107,145. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed June 22, 1906. By which existing manual exchange switchboards can be converted into semi-automatic.

1,107,146. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed July 14, 1906. Connective means comprising as its essential elements relays only.

1,107,147. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed July 14, 1906. Manually controlled connecting means for answering and automatic switching apparatus consisting of all relays for connecting with wanted line.

1,107,148. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Aug. 1, 1906. Subscribers calls are distributed among connective terminals in an improved manner.

1,107,149. SELECTIVE APPARATUS FOR SYSTEMS OF COMMUNICATION; E. B. Clement, Washington, D. C. App. filed Oct. 11, 1906. Combination of relays controlling the circuits and less in number than the total number of circuits.

1,107,040.—Revolver Flashlight

1,107,150. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Nov. 26, 1906. Improvements in sending machine or impulse transmitter and the circuit therefor.

1,107,151. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed April 24, 1907. Has a number of groups of selector and connector switches less than the number of lines to be served.

1,107,152. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Dec. 26, 1907. Subscribers' lines terminate with contacts of relays, which are divided into certain groups.

1,107,153. ELECTRIC SWITCH; E. E. Clement, Washington, D. C. App. filed July 15, 1907. Simplified form of selective step-by-step switch having multiple arms and bank contacts arranged in the segment of a circle.

1,107,154. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Nov. 23, 1905. Has main and so-called "equalizing" switchboards.

1,107,155. TELEPHONE REGISTERING SYSTEM; E. E. Clement, Washington, D. C. App. filed April 15, 1905. Records particular operator who handled a particular volume of business, calls made and answered by the called subscriber, and elapsed time.

1,107,156. TELEPHONE REGISTERING SYSTEM; E. E. Clement, Washington, D. C. App. filed Feb. 23, 1905. For registering messages and their duration.

1,107,157. TELEPHONE EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Sept. 13, 1905. For automatically ringing a wanted subscriber and ceasing to ring when subscriber answers.

1,107,228. AGRICULTURAL TROLLEY SYSTEM; E. W. Sanderson, New York, N. Y. App. filed June 9, 1913. Tractor pulls the feeder wires laterally.

1,107,233. RESISTANCE ELEMENT; C. N. Moore, Schenectady, N. Y. App. filed May 11, 1914. Resistance conductor with granular insulating material inclosed in tube and subjected to successive swaging operations.